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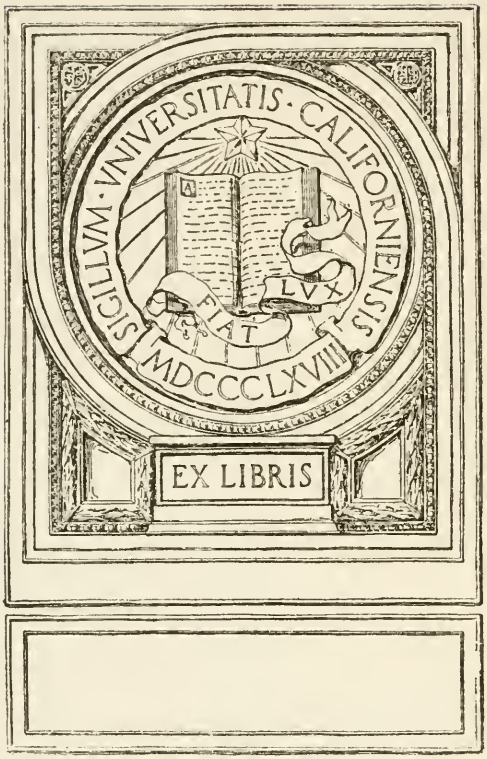
Practical Exercises in Geography

Book One

Our Own Country and Her Possessions

Sutherland and Sanford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"AND HE JOURNEYED WITHOUT RESTING,
TILL HE HEARD THE CATARACT'S LAUGHTER,
HEARD THE FALLS OF MINNEHAHA."

PRACTICAL EXERCISES

IN

GEOGRAPHY

BOOK ONE

OUR OWN COUNTRY AND HER POSSESSIONS

BY

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PREFACE

This Series, Practical Exercises in Geography, Book One, Our Own Country and Her Possessions, and Book Two, South America and Eurasia, is written for the upper elementary grades. These manuals have been prepared primarily because there is an emphatic and widespread dissatisfaction with the results of geography teaching, especially in grammar grades. The authors have attempted to present and organize the subject matter of geography in a way that will secure more satisfactory results.

In preparing this series the following conditions have been taken into consideration: (1) Grade teachers are overworked and lack time and energy to evaluate and organize the lessons which textbooks contain. (2) Textbooks are condensed and encyclopedic; therefore text materials, without careful selection and organization by the teacher, introduce irrelevant matter, scatter the attention, and tend to reduce all subjects to a dead line; this is in the nature of the case, and is no condemnation of the textbook. (3) Good results make imperative the disentanglement and greater logical development of topics that are genuinely educative. The exercises in this manual furnish motives for study, develop initiative, and insure interest by challenging the mind through the presentation of interesting problems. (4) Indefinite rote work often characterizes formal text lessons. These exercises require thought and reason, and organize geographical material in a way that makes it interesting and meaningful.

This series is not a substitute for a textbook. The exercises cannot well be used independently. In preparing the work, many textbooks have been consulted on almost every exercise and problem; hence the manuals may be used with *any* text.

A most important consideration in this method of presentation is that it teaches pupils *how to study*. The present status of geography work in the public schools leads to an abuse of books, rather than to the most important acquisition, how to use and study them. The exercises in this manual require the use of textbooks and reference books for *definite* ends and purposes. These exercises not only direct the way, but make the observance of a rational method imperative.

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The authors present this series with the sincere belief that its use will materially improve the instruction in this important subject; that the pupils will have a new interest awakened through a definite and logical procedure; and finally, that the overtaxed teacher will have her burden lightened through the use of logical problematical lessons.

Acknowledgments are due the Keystone View Company, Meadville, Pa., The Public School Publishing Company, Bloomington, Illinois, Underwood and Underwood, New York City, the United States Geological Survey, and the Wisconsin Geological Survey, for the use of illustrative material for this volume.

SUTHERLAND AND SANFORD.

Platteville, Wisconsin, April 1, 1915.

SUGGESTIONS TO TEACHERS

One of the first things the teacher should endeavor to accomplish is that of teaching pupils how to use their books in working out the problems. Pupils are so accustomed to study geography page by page that they seldom make use of Tables of Contents, Lists of Maps, Charts, and Indexes. Teachers should familiarize pupils of the upper grades with the various tools for study which their textbooks afford. They should test pupils as follows: "Is there a *Forest Map* in your geography?" "On what page?" "Consult the list of special maps in the front of your book to learn the page." "We shall often need to use this map." "Let us remember how to find it." "Is there a *Railroad Map* in your textbook?" "How can you find it?" etc., etc.

Select subjects at random as *Hawaii* or *St. Paul*, and drill as follows: "Find a reference to Hawaii." "How can you find the page on which to look?" "Refer to the index in your book." "Where is it?" "How quickly can you find a reference to any subject?"

In like manner, the pupils should be taught something of the use of the Statistical Tables and where to find them, together with the Pronouncing Vocabulary and its use. Little time, however, need be given to such use of the book *in general*, for the exercises and problems will require the constant use of the text as a reference book. Hence, in a short time the pupil will have gained due proficiency in this phase of *the art of study*. But in the beginning, pupils may be quite at sea unless some general suggestions are given.

Our better textbooks are rich in pictures and graphs, and pupils should early begin to use them. Only an introduction, however, need at first be given, as frequent reference and use will be made of these devices for expressing truths and making comparisons, as the work advances.

Value of Notebooks

Each pupil should provide himself with a good notebook, containing paper suitable for writing notes and descriptions; and other sheets, also, for drawing maps. Loose-leaf notebooks are recommended.

The penmanship in the notebooks should always be neat and legible. Pupils should be made to feel that misspellings are positively inexcusable, inasmuch as the textbook containing the pronouncing vocabulary is always at hand.

Maps should always be drawn neatly. From the very first, no careless drawing should be accepted. A careless notebook is worse than none.

Pupils should be taught, also, to arrange work attractively upon the page. A rather large map should be placed in the middle of the sheet, while small illustrative sketches may often be placed to the left or right, with descriptive material filling the remainder of the page.

Graphs and tabulations are often called for, and in the beginning teachers will need to direct with care. Remember that pupils love to work with their hands, and the written exercise will become a means of getting indifferent pupils to work.

Often pictures and useful statistics may be clipped from magazines and pamphlets and pasted in the notebooks. Illustrations should be selected for their educative value and not for their novelty or uniqueness.

The notebook, while not an end in itself, should, at the end of the year, represent a piece of work of which the pupil will be proud.

Map Drawing

The map is a device for expressing geographical facts. Sometimes, mere sketches are sufficient; but they should be neatly drawn. Often, such sketches may be small, and represent only one or two geographical features. For instance, a sketch may sometimes show only a river with, perhaps, a single city located upon it. Pupils should be taught to sketch streams, beginning at their sources and drawing toward their mouths. The line representing the stream should be very light at the source and become heavier as the stream advances. Cities should be located on the proper side of the stream. If the sketch is to be of real value, due care must be taken to have it correct.

Relief maps should be drawn; as well as political maps and sketch maps. One of the most convenient relief maps is a *pencil model*, or what is often called a light and shade map. A map of this kind is shown in Fig. 70. While at first the pencil models may seem a little difficult, pupils soon acquire considerable skill in making them. In the beginning, only simple pencil models should be attempted. The teacher, herself, will find excellent suggestions if she will refer to Miss Ida Heffron's "Chalk Modeling." The teacher of upper-grade geography should understand the use of the United States Geological Survey maps. A few typical exercises based upon them have been introduced. Teachers of

physical geography find these maps almost indispensable. While some may think that they are too difficult for upper-grade children, experience proves that boys and girls in the grades learn the use of these maps quite as readily as do the pupils in the high school.

In connection with exercises on climate and rainfall, the daily weather map may often be used to advantage. Indeed, children should be taught how to read these maps. They can be obtained from the Weather Bureau, Department of Agriculture, Washington, D.C., or at some near-by substation. In teaching the Planetary Winds, the teacher can often make excellent use of the Pilot Chart, issued by the United States Coast and Geodetic Survey. The United States Weather Bureau publishes, also, a cloud chart which will be useful in the schoolroom. Most of these publications are free. The United States Geological Survey maps, however, cost ten cents each.

The teacher will recognize the fact that map drawing is not an end in itself. The rather old-fashioned plan of requiring pupils to copy maps exactly as found in the textbooks is open to criticism. The best map exercise requires the pupil to interpret one kind of map, and to express the geographical facts through the use of an entirely different set of map symbols. For instance, even grade pupils can be taught to represent the geographical features of a United States Geological Survey map, through the construction of a pencil model. It will be remembered, however, that the value of any graph, profile, sketch, political, or relief map depends upon the care and accuracy with which it is made.

Exercises and Problems

Each exercise or problem represents a unit. Often, problems are too long for a single lesson and are divided into two or more lessons. It may often be wise for the teacher to further divide other problems or exercises into smaller divisions.

Pupils are supposed to work out the problem or exercise during their study period. The recitation period is to be used in discussing, elaborating, and supplementing the work. The teacher, here as in other subjects, must be careful in her assignments. While the authors have assumed little help from the teacher, they still assume a teacher. To assign by saying "Take Problem 10," may be open to severe criticism. Before making the assignment the teacher should have read carefully the selected exercise. If there is a question or direction likely to be misunderstood by the pupils, the teacher should caution the pupils, and if necessary give some suggestion. On the following day the pupils will be ready to attack the exercise intelligently. The teacher must insist that

the directions be followed and the questions answered. The pupil should give his best answer, even though he may sometimes be wrong. Corrections may be made in the geography recitation, the same as in the recitation in arithmetic.

It is not supposed, either, that the Practical Exercises form a complete course. While they form the backbone of the course, like the laboratory manual in chemistry, complementary and collateral readings, discussions, and reports should be employed to round out topics and bind together the studies in the exercises and problems.

Regional Geography

The problems and exercises are based upon the Physiographic Regions and not upon the political divisions of the country. There is much economy in this procedure. If the teacher is not accustomed to the study of physiographic regions, she should at once familiarize herself with the regional unit. A few short drills upon a good physical or relief map will give the pupils a satisfactory working knowledge of the regions of the United States. It will be noted that the chapter headings in this volume are practically synonymous with the names of the physiographic regions of our country.

Note. — "The Teaching of Geography" by W. J. Sutherland, published by Scott, Foresman & Company, will be especially helpful to teachers in directing the work outlined in this book.

CONTENTS

CHAPTER		PAGE
I.	The New England Plateaus: Their History and Resources	1
II.	The Atlantic Coastal Plains General Character of the Atlantic Coastal Plains, 17. Two Minor Industries of the Atlantic Coastal Plains, 28.	17
III.	The Gulf Coastal Plains General Character of the Gulf Coastal Plains, 31. Cotton, 34. Cane Sugar, 38. Rice in the United States, 41.	31
IV.	The Appalachian Region The Piedmont Belt, 48. The Appalachian Mountains, 49. The Alleghany Plateau, 50. The Coal Industry, 54. The Potato Industry, 63.	48
V.	The Lake Plains General Character of the Lake Plains, 67. The Dairy Industry, 73. The Iron and Steel Industry, 78.	67
VI.	The Prairie Plains General Character of the Prairie Plains, 88. The Production of Corn in the United States, 96. Some Uses of Indian Corn, 98.	88
VII.	The Ozark Region The Ozark Uplift, 107. The Mining of Lead and Zinc, 108. The Apple Industry, 110.	107
VIII.	The Great Plains General Character of the Great Plains, 111. The Nature of a Cyclone — Causes of Cyclones, 114. The Wool Industry, 120. The Wheat Industry, 124.	111
IX.	The Rocky Mountains General Character of the Rocky Mountains, 129. The Beet Sugar Industry, 133.	129
X.	The Columbia Plateau History and Resources of the Columbia Plateau, 135. Dry Farming, 137.	135
XI.	The Colorado Plateaus General Character of the Colorado Plateaus, 143. Irrigation in the United States, 148.	143

CHAPTER PAGE

XII. The Basin Region: Its History. Distribution of Population . . 152

XIII. The Pacific Slope 158
General Character of the Pacific Slope, 158. Fruit Growing, 167. Salmon Fishing, 170. Petroleum, 171.

XIV. Our American Possessions 181
Alaska, 181. The Philippine Islands, 182. Hawaii, 183. Porto Rico, 185. Hemp Growing, 187.

Index 193

PRACTICAL EXERCISES IN GEOGRAPHY

CHAPTER I

THE NEW ENGLAND PLATEAUS

It may seem a little strange to speak of the New England Plateaus rather than the New England States, for indeed the two expressions refer to practically the same region.

New England was once a very mountainous country. At the present time, however, it consists of a number of rather high plateaus which have been formed by the partial wearing away of the mountains. Now the slopes are gentle and the mountain tops rounded and blunt. Valleys are narrow, and extensive plains are nowhere to be found. In the main the country is a high, broken region, abounding in lakes and waterfalls. The scenery is picturesque, but the soils are thin and unproductive, and the natural resources limited.

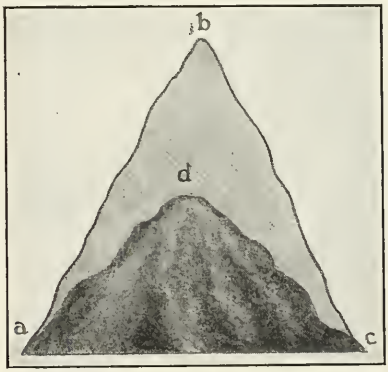

Fig. 1.—*abc* Represents Young Mountains; *adc* Represents Old Mountains

All parts of the known world have at some time been covered with water. New England, itself, was once a sea bottom. The sands and clays that accumulated on the sea floor hardened into rock. A long, long time after all this occurred, the sea floor was lifted, the water receded, and the rocky sea bed appeared as dry land.

When the old sea floor was lifted, the rock layers were greatly crushed and folded. The folds were very large and formed mountains. The

great pressure that crushed and folded the rocks produced so much heat that the rocks were often melted. When they cooled, crystals were formed in much the same way as they form in freezing water. Hence most of the rocks in New England contain crystals, and are called crystalline. We know them as granites and marbles.

At first, the mountains stood up with sharp peaks and steep slopes. The broken crust might have looked like Figure 1. Centuries passed during which the rains, winds, and glaciers wore off the mountain peaks; the steep slopes, therefore, became gentle, and the mountains became more nearly what we know them to be to-day. Running water, snow-slides, winds, and the cultivation of the more gentle slopes, tend even to-day to carry the rocks, clays, and sands of the ridges and mountain tops into the valleys and even into the ocean, thus making the country more nearly level. We call the mountains *old* because they have suffered such great changes in the millions of years that have passed since they were formed by the crushing and folding. Some day, a long time off, the New England country will be worn down almost to the level of the sea; then it will be spoken of as a *base-leveled* region.

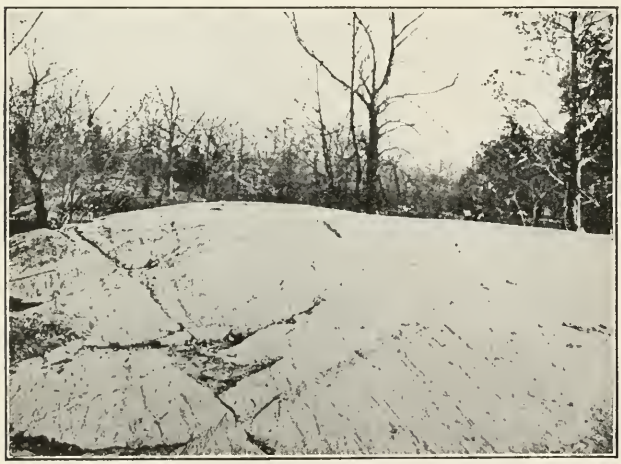

Fig. 2. — Glacial Scratched Rock in New England

New England is a small region. The rivers are not very large or long. Their currents are swift and often plunge over rocky ledges or obstructions, forming falls. The river valleys are not extensive, hence level farm lands are not abundant. The Connecticut River valley, however, is important. This valley is carved out of loose, red sandstone and hence is known as the "Red Sandstone Valley." It is well adapted to the growth of "long-leaf" tobacco.

Great glaciers have passed over New England. The huge ice sheets, perhaps a mile in thickness, slid slowly over the country and even invaded the sea, where great blocks were broken off and floated away as icebergs. These glaciers helped greatly in wearing down the mountain ridges and rounding off the peaks. In many parts of the country, today, the glacial scratches on the exposed rocks of the hills and mountains are plainly seen. Only a thin layer of soil is found on the New England slopes and uplands.

Fig. 3. — Granite Quarries, Concord, N. H.

The glacier was like a great plow or scraper, and therefore moved large quantities of clay, sand, and rock. Often this material was left in ridges called *moraines*. These ridges sometimes crossed river valleys, damming the water and forming lakes. When the water overflows the ridges, waterfalls are formed. Large quantities of glacial débris, or *drift*, as it is called, were pushed into the shallow sea and formed islands, as Long Island, Marthas Vineyard, etc. When the glacial material fringed the shore, narrow plains were formed. Cape Cod is of glacial origin; its present shape having been determined by ocean currents. In some instances the ice scoured out and widened the river mouths, making better harbors. Thus the glacier had a marked effect upon the surface and soils of the country. Winds, rains, and shore currents, however, are in many places reshaping the surface and contour of the country.

The coast line of New England has vastly influenced her history. The gradual sinking of the coast allowed the sea to enter the lower, wider valleys, flooding them and converting the river mouths into broad estuaries. Much of the coastal plain became a narrow conti-

nental shelf. Higher portions, fringing the old sea, became isolated, forming numerous islands, of which Mt. Desert is a type. The intrusion of the sea into the valleys made the water deep and the harbors good. The high portions between the river mouths became capes and promontories. The enduring rocks of Cape Ann preserved the site of Gloucester, and later pointed her daring fishermen to the sea. Maine's irregular coast, with its reëntrant bays and spearhead promontories, so numerous and intricate, has been increased tenfold.

The soils of New England were thin, consisting of sand and clay, all well mixed with glacial boulders. Much of the country was well forested. The pine thrived well in sandy soil, well watered, and in latitudes where there were extremes of heat and cold. These conditions prevailed in New England, and here "the murmuring pines and the hemlocks" said their incantations to the sleek moose and the painted savage. Such was New England when found by English Puritans.

EXERCISE 1: Position and Area of New England

1. Write the names of the New England States with their capitals, being careful to spell them correctly.

2. Find the area of the largest state;* of the smallest. Compare the area of New England with the area of your own state. Record your answers neatly in your notebook.

3. What parallel forms the northern boundary of Vermont? Near what cities does this parallel cut the Mississippi River? Near what city does it cut the Pacific coast line?

4. In round numbers state the population of New England. Divide by the area to find the population per square mile.

5. Measuring in a straight line, find the distance from the capital of your state to Boston.

6. By use of the scale estimate the length of New England's coast line. Think of one advantage of the long coast line.

7. What meridian cuts Cape Cod? About how far is Boston from London?

*Note. — For such data, always consult the statistical table in the back of your textbook.

EXERCISE 2: Surface of New England

1. Examine a map to learn of the surface of New England. Write a sentence to describe its general character.

2. Write the names of the states in which mountain ranges or peaks are found. Tabulate in this way:

1.	Vermont	Green Mts.
2.	. . . . .	etc.

3. Write a sentence stating the general character of the surface.

4. Examine some picture of New England surface found in your textbook. Read the description of The New England Plateaus in this chapter to learn the reason for gentle slopes and rounded tops. Record the reasons in your own language.

5. Mt. Washington is the highest peak in New England. Consult the tables in your geography to find its height. Is this mountain difficult to ascend?

6. Study your map to determine the arrangement of the mountains. Name and locate a well-defined range. What mountains form a scattered group?

7. Judging from the relief map, what river in New England has the best-defined valley? Verify by reference to the text material in this chapter.

8. Judging from a good picture, what do you think is true concerning the valleys of New England?

9. In what states is there lowland along the coast? Estimate the percentage of cultivable land in New England.

10. If your school has a stereoscope, examine views of New England surface.

PROBLEM 1: Why should Factories be located at Waterfalls?

1. Study the picture, Fig. 4, and name the three most conspicuous features.

2. The falls are of glacial origin. Falls of this kind are quite common in New England. Show how falls may be a result of glacial action.

3. This picture represents a scene at Lawrence. What, then, is manufactured in the factory beyond the bridge? Read your textbook to verify your inference. What river is this? Learn to spell its name correctly.

4. Why do you think Lawrence grew up at this point? Give two reasons.

5. Review your textbook to learn two other New England cities located at waterfalls. Name them. State in what industry each is engaged.

6. Why should factories and mills be located near falls?

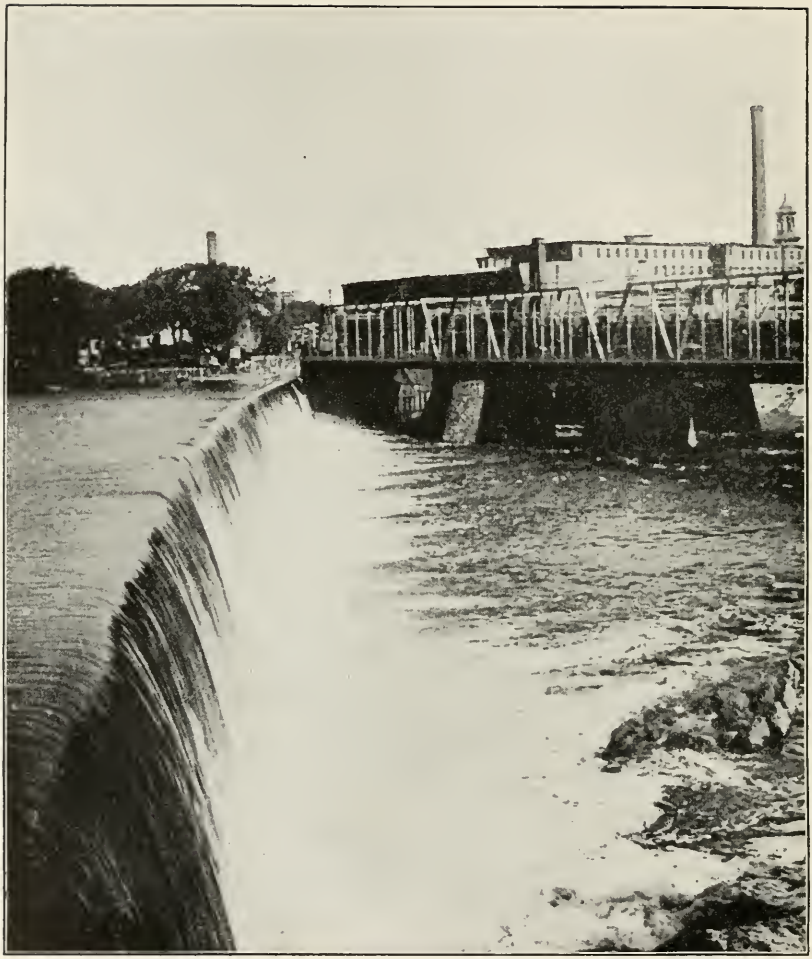

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FIG. 4. — FALLS ON MERRIMAC PROVIDING POWER FOR COTTON MILLS, LAWRENCE, MASS.

PROBLEM 2: What Influence have the Rivers of New England had on the Development of Manufactures?

I

1. Select five leading rivers by reference to your map. Trace their courses carefully.

2. Write the names of the selected rivers. How many of them drain lakes? Write the name and location of one of these lakes.

3. How do lakes affect the volume of water that rivers carry? Will such rivers "run dry" in summer? Why can they be depended upon to furnish sufficient water to turn water wheels at all times? Write your explanation.

4. Remembering the surface or topography of New England, why should you expect waterfalls to be numerous? Look through the descriptive matter in your textbook to verify your inference.

5. Look carefully through your textbook to ascertain if cities are often located at waterfalls. Why? What mention is made of Lowell? Of Holyoke? Of Lewiston? Of Pawtucket? Why do you think Fall River was so named? Record the leading manufactures of each.

II

6. Consult a map showing the mouths of the larger New England rivers. Why do you think ships can ascend these rivers for some distance?

7. At what point in a stream is water power best? Why, then, are cities often located at waterfalls? In what will such cities engage? Why?

8. How do waterfalls affect the navigability of rivers? Below what point are New England rivers usually navigable? Why?

9. In the main, where are the manufacturing cities in New England located?

10. An ideal river for manufacturing purposes must possess three characteristics. Name them.

11. Examine your map and read your textbook to determine if the leading rivers of New England possess these characteristics. Record your results.

III

12. The Merrimac River has borne the distinction of " turning more spindles than any other river in the world." Study your map carefully and write a short essay showing why the water power of this stream is so valuable. Name three important cities on this river and study your textbook to find out the leading manufactures.

13. How, then, have the rivers of New England influenced the development of manufactures?

(By supplementary questions, the teacher should review this problem to make sure that it is understood. *Geographical Influences in American History*, Chap. II, A. P. Brigham, is an excellent reference for teacher and pupils.)

EXERCISE 3: (Optional) The Boothbay Sheet, Coast of Maine

1. Find the village of Boothbay on the Boothbay Sheet. The village is about fifteen miles east of Bath, Maine.

2. Find the difference in longitude between the bounding meridians. By the use of the scale, find the distance in *miles* between these meridians.

3. By use of the scale find the distance in a straight line from Spruce Pt. to Hodgdon Cove. Trace the course one would take in walking from one point to the other, keeping as close as possible to the shore. About how far would he travel? Why would the distance be so great?

4. Starting at any point on the shore line and traveling inland, the first light line represents land surface 20 ft. above the sea; the second represents land 40 ft. above the sea; the third 60 ft., etc. Find the highest point on Linekin Neck; on Southport Island. (Your teacher will verify your results.)

5. Examine the map in many places. Does the land rise abruptly from the sea? Is the land surface rough or smooth? Do you think the land can be farmed? What industry do you think the people follow? (Answer in complete sentences.)

6. Consult your textbook to learn whether good harbors are numerous along the coast of Maine.

7. Look on the coast of the Boothbay Sheet for harbors. Find three.

8. Make a statement showing a relationship between uneven coast lines and good harbors.

9. Review text material in this chapter to find some statement that tells *why* this shore is so irregular.

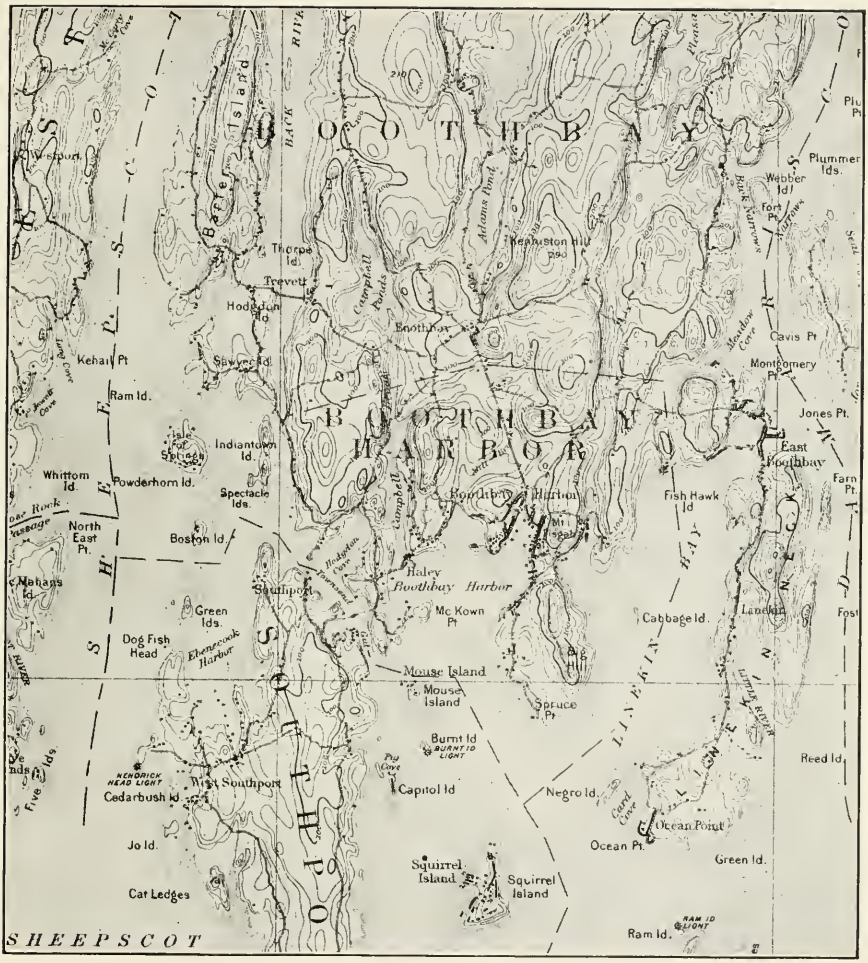

FIG. 5. — A PORTION OF THE BOOTHBAY SHEET

Scale, about 2 miles to the inch. Contour interval, 20 feet.

NOTE. — The Boothbay Sheet is a publication of the U. S. Geological Survey, Dept. of Agriculture, Washington, D.C. The teacher should send for the following sheets to use in connection with the exercises in this book. Cost of each, 10¢.

Boothbay Sheet	Caldwell Sheet
Atlantic City Sheet	Mt. Shasta Sheet
Donaldsonville Sheet	Kaibab Sheet
St. Paul Sheet	Ottawa Sheet

PROBLEM 3: Why is Fishing profitable off the Coast of New England?

I

1. Consult the maps in your textbook to find the Gulf Current or Gulf Stream. In what direction does it flow? On an outline map of North America show by arrows the course that the Gulf Current follows.

2. On the same map show by arrows the course pursued by the Labrador Current.

3. Which current is nearer the New England coast?

4. A cold current from the north and a warm current from the south meeting and passing each other determine water areas differing widely in temperature. This, in part, explains the many varieties of fish found off the New England coast. Review your textbook and write a statement enumerating the kinds of food fishes that abound.

5. Consult Webster's New International Dictionary and sketch neatly pictures of the cod, mackerel, and halibut.

II

6. Ocean currents bearing icebergs and sediment often deposit their loads and build up banks in shallow seas. Locate the Grand Bank of Newfoundland. What of the relative depth of the water over this bank? Read carefully the text material in your geography to determine whether the region of the Grand Bank abounds in food fishes. What fishes are found here? Do you infer that these fishes prefer shallow water?

7. An abundance of food for the lower forms of marine life is wafted in by the ocean currents. Upon these lower forms of animal life the food fishes live. Enumerate, then, the three oceanic conditions which favor the multiplication and abundance of food fishes.

8. Gloucester, Massachusetts, has long been noted as a fishing station. Review your textbook to see if mention is made of Gloucester. Record the facts in your own language.

9. Tell in detail the method of catching the cod, the mackerel, the halibut.

EXERCISE 4: Forests and Lumbering in New England

I

1. Consult the forest map of the United States. (Lists of maps are usually found in the front of a textbook. Pupils *should refer* to the "Lists" to learn the page on which the " Forest Map " is found.)

   a. In what " forest belt " is New England?
   b. What kinds of trees grow in this belt?

2. Consult your textbook and record the forest trees mentioned.

   a. Which are best for lumber?
   b. Which are used in making paper?
   c. Which are used in tanning leather?

3. Your textbook should tell you in which states forests are most extensive. Name these states. In what state is Mt. Katahdin located? From the summit of Mt. Katahdin one can see twenty-five miles in any direction, yet cannot see a single acre of cleared land. Why?

4. Read in your textbook to find mention of the city or cities engaged largely in the lumber industry. Locate these cities. Make a small sketch of the river upon which the leading lumber city is situated. Locate the city.

5. Recite to your teacher the method of lumbering in the Maine woods.

6. Write two reasons for removing the forests.

PROBLEM 4: What is the Present Status of Agriculture in New England?

I

1. Review text material in this manual on New England and select as many statements as you can find relating to agriculture.

2. What reference is made to the quality of the soils? State the facts in your own language.

3. What mention is made of the soils in the Connecticut Valley? Of what character are they? They are adapted to the growth of what crop?

4. Ascertain how extensive is agriculture in Maine. State the leading crop.

5. If your textbook makes mention of truck farming, state where it is carried on. Why is the demand for garden products good in New England?

II

6. Is any reference made in your textbook to dairying in New England? Name the state or states engaged in this industry.

7. How can the farmer use the rugged slopes and hilly lands to advantage?

8. Consult your textbook carefully to see if any statement is made concerning agriculture on Cape Cod. What particular crop is grown there? (Cape Cod, New Jersey, and Wisconsin produce 96 per cent of the entire cranberry crop of the United States.) What conditions favor this crop?

9. Write a statement enumerating the various crops that are grown in Vermont. Discover two conditions that favor agriculture in this state.

10. In New England 80 per cent of the people dwell in cities, usually near the coast. What do you infer, therefore, concerning the attention given to agriculture? How do you think the price of farm lands has been affected by the movement of people to the cities? Why?

11. Explain how the high cost of living is encouraging people to return to the farms. (See No. 1, Prob. 6.) Explain two methods by which neglected lands can be made more productive. What do you infer concerning the present status of agriculture? What concerning the *future* of the industry?

PROBLEM 5: Of What Commercial Importance are the Rocks of New England?

1. What kinds of stone are valuable to commerce? Which of these are found in New England?

2. Crystalline rocks are most valuable for monuments and ornamental building because they permit of a high polish. Name the crystalline rocks most important in commerce. (See the description of the New England Plateaus in this chapter.)

3. Find three cities that engage in quarrying. Locate each.

4. Ascertain if ornamental stones from New England quarries come to your city or neighborhood. What are they? If possible stop at a monument works and get specimens.

5. Observe marble and granite closely. Can the crystals be seen in each? Which takes the higher polish? Why? Observe monuments and make inquiries.

6. In 1910 the value of the pig iron produced in the United States was $425,000,000. The value of the quarried stone was $76,000,000. Compute the per cent. Knowing that iron is the most important commercial mineral, what do you conclude concerning quarrying as an industry? Verify by reference to your textbook.

7. How do unfavorable conditions for agriculture in New England contribute to the development of other industries? Why are New England quarries extensively worked? Record your answers.

PROBLEM 6: Why are the People of New England largely engaged in Manufacturing?

I

1. The largest net profits determine the leading industry of a people. New England has been, in order, largely engaged in agriculture, commerce, and manufacturing.

2. Why did the colonists first engage largely in agriculture?

3. Why did the war between England and France (1793–1815) lead the New England people to engage largely in commerce? Why was the industry profitable?

4. Show why the embargo of 1807 caused New England's men and ships to be idle. How did unemployed men, ships, and money encourage factory building?[1]

5. Name two ways in which rivers have favored manufacturing. (See Problem 2.)

6. Make a small outline map of New England. Shade in *red* those states largely engaged in the *textile* industry. Where is the cotton grown? The wool produced?

7. About one-half of our boots and shoes are made in Massachusetts. Name a leading city in this industry. Where are the hides obtained? The bark?

8. Read your textbook to learn the character of metal goods made. Explain. Place a square around the city that excels in watches. A circle around the one that excels in silver and plated ware.

9. Write three reasons why New England has become a leading manufacturing district. Why are people now returning to the farms?

[1] See United States History.

PROBLEM 7: What Influences has the Shore Line of New England exerted on her Industries?

I

1. Make a sketch of New England in your notebook. Show the principal mountains and five important rivers. (Have your teacher show you how to represent mountains.) Take great pains with this exercise.

II

2. Observe closely the trend of the coast. (If the school is supplied with a copy of the " Boothbay Sheet " it should be posted on the bulletin board for observation by the pupils.) Write sentences describing the following:

a. Character of the shore line.

b. Width of the river mouths. Select one for illustration. Name two bays that indent the coast.

c. Number of promontories and capes. Name two.

d. Islands that fringe the coast. Name them.

III

3. The shore of New England is slowly sinking. As the land subsides, the ocean water flows in and floods the lowlands.

a. How does inflowing water affect the currents of the rivers? The width of the river mouths? The depth of the water in the main channels?

b. Does a subsidence or *sinking* of a coast tend to make the shore line even or uneven? Write two sentences to tell why.

c. Write one sentence to tell why the harbors are good. Find a statement in your textbook that seems to verify your answer.

d. Lawrence and Lowell have good water power and are engaged in manufacturing. Study your map carefully, and make small sketches of the Merrimac River to show the location of these cities. How has the sinking of the shore made conditions favorable to the growth of the cotton industry in these cities? Write an explanation.

e. Select from your map two other New England cities whose conditions for manufacture and commerce seem to have been influenced by a sinking coast.

f. In complete sentences state three conditions that are results of the sinking coast. Why does each condition favor an industry?

PROBLEM 8: What Conditions have led to the Development of Boston into a Large City?

I

1. Consult a map showing the location of Boston. Make a sketch showing its location.

2. What is its population? Compare with New York, Chicago, and St. Louis. Record these populations in round numbers. How does Boston compare in size with the largest city in your own state?

3. By use of the scale determine the width of Boston harbor. Consult your textbook for an answer. Write a short description of Boston harbor, mentioning its two excellent features.

4. What effect does a good harbor have upon the shipping of Boston? Consult your textbook to see if you are right. Why would extensive commerce influence people to live in Boston?

5. What early colony located on Boston harbor? Study your map carefully and think of one advantage a location on this harbor affords. (Consult your American History.)

II

6. Consult your map to see if Boston is surrounded by small cities. Write in your notebook the names of three of them. Does your textbook name an industry of each? Record. At what harbor would the raw cotton for Somerville land? Name the important material that Brockton needs for her factories. How then do the industries of these cities contribute to the growth of Boston? Write your answer in a short paragraph.

7. Does the fact that the harbor extends so far inland make it easier for railroads to reach Boston from all directions? Write a sentence giving one reason why Boston is a railroad center.

8. At first Boston was shut off from the West by the Hoosac Mountains, sometimes known as the Berkshire Hills. Locate them. In 1875 a great tunnel was cut through these mountains, thus placing Boston in close trade relations with the West. Write a sentence in which you locate Hoosac Tunnel, and another to tell why it has contributed so much to the growth of Boston.

9. Write three reasons why Boston has become an important city.

EXERCISE 5: Product Map of the New England States

1. Draw an outline map of the New England States. Print neatly in the proper place the name of each state. (Be careful to spell correctly.)

2. Sketch and label the five most important rivers of New England.

3. Indicate the location of the capital of each state. Locate five other important cities.

4. In which state is the lumber industry most important? Print *Lumber* in the proper place.

5. In which states is most of the granite quarried? Print *Granite* in the proper places.

6. In what part of New England are most of the cotton and woolen mills? Print *Cotton Goods* and *Woolens* in their proper places.

7. In a similar manner show where the following articles are produced: boots, shoes, paper, watches, and rifles. (When the map is completed it should be labeled *Product Map of New England.*)

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CHAPTER II

THE ATLANTIC COASTAL PLAINS

GENERAL CHARACTER OF THE ATLANTIC COASTAL PLAINS

Beginning at New York City and extending southward all along the Atlantic coast, is a strip of low, level land. In New Jersey it is about 50 miles wide and broadens to 200 miles or more as you go south. Two east-west surveys of the Coastal Plains are here made.

The city of Trenton, New Jersey, is on the western margin of the Atlantic Coastal Plains. This marginal line is the natural boundary between the Coastal Plains and the Piedmont Belt. Trenton is in a valley of soft rock through which flows the Delaware River. Eastward from Trenton stretches a rolling, hilly country of moderate elevation and well suited to agriculture. From this farming belt the surface descends in gentle slopes to the coastal lowlands. The soil on these slopes is too sandy to be productive, but the region is covered with pine forests. Half of New Jersey is still forested.

In South Carolina extensive sand bars skirt the coast. The shore is fringed also with islands that have been formed of sediment, carried by the rivers, and banked up at their outlets by ocean currents and waves. On these islands is grown the famous sea-island cotton. In the shallow waters between them and the coast, oyster farming is an industry of increasing importance. Back of the sand bars are extensive lagoons.

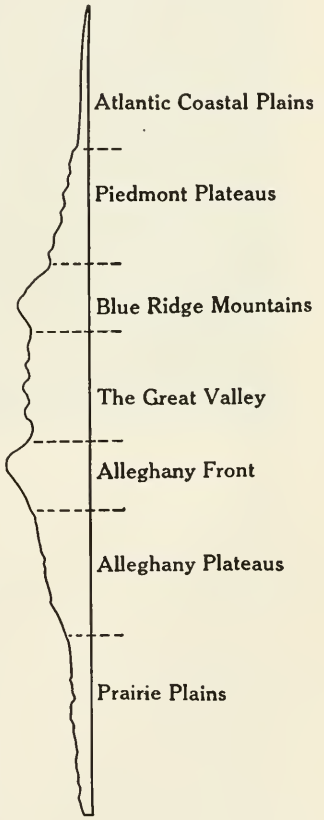

Fig. 6. — Profile of the Appalachian Mountains

West of the shore line there is a smooth, flat, coastal lowland about forty miles in width. Near the ocean, swamps and marshes are numerous. Back of the swamps, this low, sandy belt is called the " pine bar-

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Fig. 7. — South Carolina Rice Fields from Savannah, Ga.

rens." So infertile is it that less than 12 per cent is under cultivation. The production of turpentine is the chief industry.

Farther west is the central cotton district that includes fully one-fifth of South Carolina and varies in elevation from 130 feet to 270 feet. The soil here is a sandy loam. Swamps are often extensive, but they can be drained readily. Thirty per cent of this belt is under cultivation. The population numbers 45 per square mile.

The third and inner belt of the Coastal Plains includes ranges of sand hills that vary in elevation from 300 to 500 feet. Between these broken sand hills, there are elevated levels of red clay lands. This district,

which includes one-eighth of the state, is more than half forested and has about 32 people per square mile.

The Coastal Plain east of Trenton is not typical; in fact only occasionally is there a middle upland between an outer and inner lowland. In South Carolina, however, the district represents fairly well the entire southern Coastal Plain. Here there are three distinct belts: first, a low, swampy belt with open pine forests; second, a wider, moderately elevated belt with good soil largely under cultivation; and third, an inner belt of broken sand hills and elevated levels partially forested.

The margin of the Atlantic Coastal Plains is constantly changing. Once the Fall Line, that is the line that separates the Piedmont from the Coastal Plains, was the ocean shore line and the waves dashed against the crystalline rocks of the Piedmont. Then, by a slow uplift of the continent the ocean bed was so lifted that the water receded eastward. In this way all of the Atlantic Coastal Plains, once the bed of shallow ocean waters, was added to the continent. It is easy to understand why the rocks lie in strata and are not resistant, for the materials of which they are composed have not had time to become thoroughly cemented together. The soils, too, are composed largely of the sands of the decaying rocks. Since sand grains are very hard and do not easily dissolve in water, plants cannot get food readily from soils composed largely of sand. Except when well mixed with humus and other fertilizers, the soils of the Coastal Plains are not highly productive.

The Atlantic Coastal Plains, taken as a whole, constitute an extensive region of low, level land, swampy and marshy along the shore but rising very gently to the westward. The soils are sandy, and often infertile. Sandy belts of open land alternate with forests. In the main it is much less resourceful than the Piedmont belt lying to the west.

PROBLEM 1: What has determined the Location of the Inland Cities of the Coastal Plains?

I

1. Beginning with New Jersey, draw a map of all the states south, bordering the Atlantic. On this map locate the following cities: Montgomery, Macon, Augusta, Raleigh, Richmond, Washington, Philadelphia, and Trenton.

2. Tabulate these cities in your notebook, stating the river upon which each is located. Draw and label the rivers. Above your tabulation write *Fall Line Cities.*

a. Montgomery, Ala. . . . . Alabama River
b. . . . . etc.

3. Which state drawn has no Fall Line city? Read the last part of the account of the Atlantic Coastal Plains to discover an explanation.

II

4. Consult the introductory material in this chapter, and also the description of the Piedmont in your textbook, then write sentences to state the character of the rocks in both the Piedmont Belt and the Coastal Plains. Why do the rivers not readily cut deep channels in the surface of the Piedmont?

5. What is true concerning the depth of the river channels in the Coastal Plains? Why? (Write all answers in complete sentences.)

6. Under what conditions are deep ruts formed in a public highway? Why are ruts not formed in a macadamized portion of the road?

7. Where the streams pass from the Piedmont to the Coastal Plains the difference in erosion, or wear, will result in what? Verify from your textbook. Examine a profile of the Appalachians to find this feature. (As you study these questions, refer often to the material in this manual and to your textbook.)

8. What good reason can you see for naming the line which separates the Piedmont from the Coastal Plains, the "Fall Line"?

9. What name is given the cities along this line? Why is the name appropriate?

III

10. Where in a river is the current swiftest? Where is the water power best? What advantage for industry do the cities in question possess? Read the material in your textbook carefully to ascertain if at least three Fall Line cities engage in manufacturing. Tabulate the facts, stating the industry of each city.

11. When boats ascend with cargoes to the Fall Line, what becomes necessary if the goods are needed farther west? Why? Consult your dictionary for the meaning of "portage."

12. You should now think of two good reasons why the Fall Line cities are busy places. Write them, being very careful of the wording of your sentences.

13. How do falls and rapids, then, often determine the location of cities?

PROBLEM 2: What Influences have caused New York to become the Metropolis of the Atlantic Seaboard?

I

1. What is the population of New York?[1] How does it compare in size with the second largest city in the United States? Compare the population of your *state* with that of New York City.

2. Draw a neat sketch of New York harbor. Glean the statements in your textbook that tell you what kind of a harbor it is. Write two or three sentences describing the harbor.

3. Consult Chapter I, Problem 7. How did good harbors affect the locations of early settlements? When was New York settled? By whom?

4. Consult your textbook for a statement relating to the commerce of New York. Record. Why does so much of our foreign trade pass through this city?

5. Is the Hudson River navigable? How far? Describe the water route connecting New York with the Great Lakes. Write a sentence telling exactly how this commercial route affects the trade of New York. When was the Erie Canal built? Were there railroads before that time? Why were water routes more important then than now?

II

6. Write the names of the states included in what is known as the "Middle West." Write a sentence stating your idea of the size and productiveness of the Middle West.

7. What waterway is the commercial outlet for the Middle West? Describe it. To what ocean port are the products carried? How would this affect the importance of the port?

8. How far is New York from the fields of coal? Of iron? (Use the scale.) Which is the more favorably located with reference to the mines, Boston or New York?

9. Find a statement relating to New York as a manufacturing center. Consult your textbook and make a list of the products manufactured. Tabulate neatly. How does New York rank with the other cities of the United States in manufacturing? (Consult your textbook.) How have coal and iron influenced the growth of New York City?

10. In a short paragraph give at least three reasons why New York has become the metropolis of the Atlantic seaboard.

[1] See *Statistical Tables*.

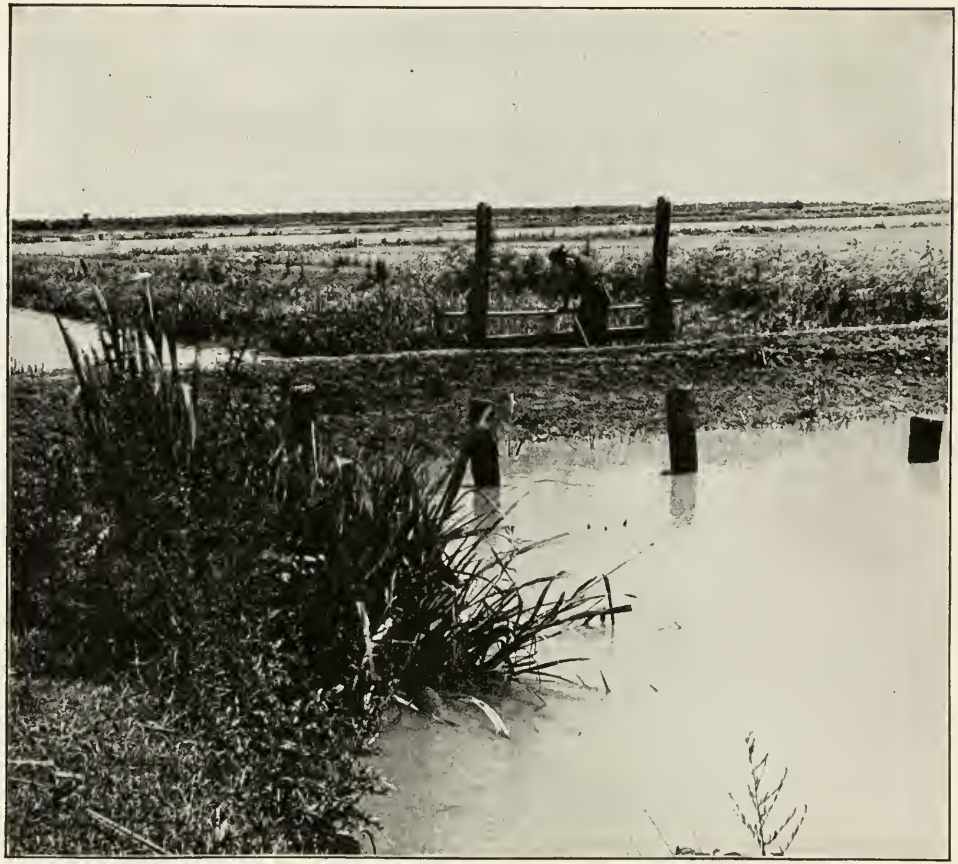

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Fig. 8. — Flooding the Rice Fields, South Carolina

PROBLEM 3: Why are there Few Important Commercial Cities on the Coast of the South Atlantic States?

I

1. Make a sketch of the Savannah River in your notebook. Locate Augusta and Savannah.

2. Is the Savannah River navigable? If so, what is the *natural* head of navigation?

3. Consult your textbook and reference books and write a short paragraph describing the advantages and industries of Augusta. If possible, find a picture of this city. Why should Augusta be styled "The Lowell of the South"? Explain why the city enjoys excellent water power.

4. Keeping in mind the shore line of New England, examine a good map of the Atlantic coast south of Cape Hatteras to see if you can determine whether natural harbors are likely to be numerous. Do you think the water along the shore is shallow or deep? Why? Are deep bays present? Do bars and reefs fringe the coast? In general is the coast rising or sinking? (Review the text material of this chapter.)

II

5. Where are the leading Coastal Plains cities south of New York located? Name the seaboard cities that seem to be important. Why is the number not larger? Name the important inland cities. Why are they more numerous?

6. Why would there be an advantage to commerce for boats to pass Savannah and ascend to Augusta? How would this practice affect Augusta? Savannah?

7. Write a short paragraph concerning the advantages and industries of Savannah. In what industry is it largely engaged?

8. Study carefully the picture in Fig. 7. Write a sentence in which you describe the land surface shown beyond the city. Savannah is in what region? Why, then, is the land level? Does it seem to be well drained? Why?

9. Compare the coast of the Atlantic Coastal Plains with the coast of New England as to regularity. Which is a rising coast? Which has more good harbors? Why?

10. State three pertinent reasons why there are few important seaboard commercial cities in this region.

EXERCISE 1: An Industry of the Atlantic Coastal Plains

1. Look carefully at the pictures and write a sentence describing the surface of eastern South Carolina.

2. What crop is under cultivation? Why do you think the crop is good? What kind of soil favors this crop?

3. Think of some easy way by which the farmer, in Fig. 8, can get the water into his cultivated field shown in Fig. 9. To do this, remember that there is an

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FIG. 9. — CULTIVATING RICE, SOUTH CAROLINA

opening through the dam on which the man is standing. The floodgate which he is lifting opens and closes the waterway. If the gate is closed, how will the volume of water beyond the dam be affected? Would the ditch soon overflow? How might this affect a near-by rice field? How could the farmer make it easier for the water of the main ditch to enter all parts of this field? Write a short account of how a rice field can be flooded.

4. What do you think the man at the floodgate is doing? When will he close the gate? When will he open it?

5. Name two conditions that are favorable to the growth of rice.

PROBLEM 4: Why has Fruit Growing become the Leading Industry in Florida?

I

1. Draw a neat sketch of Florida.

2. Consult a map showing the ocean currents of the world. On your sketch indicate the direction of the ocean current that bathes Florida. Neatly print in the name of this current. How does this current affect the temperature of Florida? Find the isotherm [1] showing its January temperature.

3. What is the latitude of southern Florida? How far is it in degrees from the Torrid Zone? Write a sentence in which you give two reasons why Florida has a mild climate. Give one reason why the climate is equable. By reference to an isothermic chart in your textbook or in Longmans' *New School Atlas*, compare the January and July temperatures of Florida.

II

4. What climatic conditions of Florida are favorable to fruit?

5. Name the greatest menace to fruit. Why is it usually absent in Florida?

6. From your textbook, find the three leading products of Florida and state them in order of importance.

7. Make a list of the Florida fruits in your notebook. If possible, find out how the state ranks in the fruit-growing industry.

8. Select two important markets for Florida's fruits and vegetables.

EXERCISE 2: (Optional) The Atlantic City Sheet, Coast of New Jersey

I

1. What is the largest city shown on the Atlantic City Sheet? Locate this city on a large map.

2. Use the scale and determine the number of miles of shore line shown on the sheet.

3. In what part of the sheet is the mainland? Locate the highest point on the mainland and give its elevation. How many miles could you travel on this mainland without going up or down more than ten feet? What does this show about the evenness of the surface?

[1] See Dictionary; also isothermic chart.

FIG. 10. — A PORTION OF THE ATLANTIC CITY SHEET
Scale, about 2 miles to the inch. Contour interval, 10 feet.

4. How wide is the salt marsh? Consult your dictionary for the meaning of the word *lagoon*. Why might the four bays shown within the marsh be called lagoons?

5. How many beaches or sand bars are shown? About how wide are these beaches? How do you think they were formed?

II

6. Are the beaches smooth or hilly? How do you know? How high are they above the sea? What is a sand dune? Locate several on these beaches. How were they formed?

7. Why do you think the location of Atlantic City is a safe one? For what is the city noted?

8. How many harbors did you find on the Boothbay Sheet? How many do you find on this sheet? Account for the difference.

9. How many large cities are there on the coast between Sandy Hook and Cape May? (See map in your textbook.) Explain the absence of cities.

10. As compared with the coast of Maine, is this shore line regular or irregular? Consult the description of the Atlantic Coastal Plains in this chapter, and also Chapter I for answers to the following: Is the New England shore line rising or sinking? The New Jersey shore line? Rising coasts make what kind of shore line? Sinking coasts?

PROBLEM 5: Why has the Chesapeake Bay become the Center of the Oyster Industry?

I

1. Read carefully the descriptive matter in your textbook concerning the oyster industry. Gather as many statements as you can regarding the conditions under which oysters thrive best. State clearly these conditions.

2. Make a neat sketch of the Chesapeake Bay. Draw the two important rivers that enter the bay. Print the names of these rivers, being careful to spell correctly. How does this bay compare in size with other bays along the coast?

3. Are the waters in the bay fresh or salt? What does the word *brackish*[1] mean? In what kind of water do oysters thrive?

[1] See Dictionary.

II

4. How do oysters secure their food? Determine whether the tides sweep in and out of the Chesapeake Bay. How, then, is food brought to the oysters? Consult Webster's New International Dictionary and sketch the picture of an oyster in your notebook.

5. Is this portion of Maryland a part of the Atlantic Coastal Plains? What does this fact suggest regarding the depth of the bay?

6. On your sketch indicate the position of Baltimore. According to your textbook, what are the industries of this city? How does the oyster industry rank with other industries?

7. From some geographical reader learn how oysters are gathered and be prepared to recite the story to your teacher during the recitation.

8. Write a short paragraph in which you give the reasons why this region has become the center of the oyster industry.

TWO MINOR INDUSTRIES OF THE ATLANTIC COASTAL PLAINS

I

Manufacture of Turpentine

From North Carolina south along the Coastal Plains grows a tall, straight pine tree known as the Georgia, or Yellow Pine. It is much harder than white pine and is used for floors and inside woodwork in houses. (Some members of the class should if possible secure pieces of both hard and soft pine.) The yellow pine trees grow very tall, but are not large around, and often have no limbs to a height of 50 feet. Forests of yellow pine are therefore open and easy to travel through. It is from the sap of the yellow pine that turpentine and rosin are made.

Early in the spring men cut deep troughs in the trees in which the thick sap or gum gathers. Every few days the surface has to be freshly cut, or nature will heal the wound and the sap will stop running. When the troughs are filled with gum, men gather it and take it to the distillery.

The gum is first mixed with water, then it is boiled. As it boils the turpentine rises in the form of vapor and, when collected in pipes and cooled, it condenses and assumes the form of a liquid. It takes four barrels of gum to make one barrel of turpentine; what remains after the

volatile substances are driven off hardens and is called rosin. (Secure a small bottle of turpentine and a piece of rosin for your geographical museum.)

Savannah is now the center of this industry and ships more turpentine than any other city. The United States exports large quantities of turpentine to Europe. At present the production is between 5,000,000 and 6,000,000 gallons per year. As turpentine farming soon kills the trees, the industry is gradually moving south to fresh forests.

II

The Peanut Industry

Though peanuts have, in the past, been little appreciated as a food, the increasing cost of meat is bringing them into extensive use. Until recently the food value of peanuts was not understood; a pound of peanuts "has as much protein as a pound of sirloin steak, plus more carbohydrate than a pound of potatoes, plus one-third as much fat as a pound of butter."

Peanuts are planted and cared for in much the same manner as potatoes. When the vines are nearly full grown, they send tendrils into the ground, and upon these the peanuts grow.

As a light, sandy soil is best suited to peanut culture, the industry is confined to the Atlantic Coastal Plains with Norfolk as the center.

Dairying is likely to accompany the peanut industry for the reason that the vines are equal to alfalfa as a food for stock.

EXERCISE 3: The Turpentine Industry

1. Learn three products of the pine other than lumber.
2. What are *naval stores?* Why so called? (Consult Dictionary.) Write a short explanation.
3. From your textbook determine the leading state for the production of turpentine. Draw a small outline of this state. Print in its name. Underneath write, *The Leading State for the Production of Turpentine.*
4. Do the same for the state that holds second rank.
5. Recite the account of the manufacture of turpentine to your teacher.

EXERCISE 4: Production Map of New York, Pennsylvania, and New Jersey

1. Using an entire page in your notebook, draw a neat outline map of these states. Print in the name of each state.

2. Read the descriptive matter in your textbook, noting carefully all of the products of these states. Make a list of these products.

3. Note the state and particular locality in which each product is found.

4. On your map print the word *Coal* wherever this product is found. Do the same for each of the other products.

5. Make a graph to show the relative values of the three leading products.

6. Label your map *Product Map of New York, Pennsylvania, and New Jersey.*

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CHAPTER III

THE GULF COASTAL PLAINS

GENERAL CHARACTER OF THE GULF COASTAL PLAINS

Bordering the Gulf of Mexico is a wide semicircle of lowlands known as the Gulf Plains. The plains extend from Cape Sable to Mexico. The region is low, often but a few feet above sea level, and nowhere does the altitude exceed 250 feet.

The middle portion of the region is made up of the delta of the Mississippi River. This delta is much more extensive than is usually supposed. It is a wedge-shaped area extending from Cairo, Illinois, to the Gulf, and gradually widening toward the South. The soils of the delta are alluvial and very rich. As the great river nears the gulf, the land surface is so low that the river *aggrades* or builds up its banks and bed. The river, therefore, is higher than the adjacent country, and when it overflows extensive areas are flooded.

Much of the Coastal Plain region has recently been lifted above the sea by a slow upheaval of the earth's crust. The soils are usually sandy except in the river valleys where floods have overlaid the sandier soil with silt and clay.

The coast line is regular. The gulf currents often sweep the sediment brought in by the streams for long distances, and when the material is deposited in the shallow, quiet waters, long bars and barrier beaches are formed. Back of the bars and barrier beaches are quiet, shallow lagoons. The longest barrier beach in the world fringes the coast of Texas.

Occasionally the coast has subsided or sunk for short distances. Mobile Bay is an estuary caused by a slight sinking of the coast at the mouth of Mobile River. As a result, Mobile has one of the best harbors on the Gulf Coast. Tampa Bay, for a similar reason, also is a good harbor.

The forests constitute the chief natural resources of the Gulf Plains. Georgia pine, cedar, and hemlock are the leading woods. Valuable beds of phosphate rock are found near Tampa. Extensive salt beds are found in southern Louisiana. Oysters thrive in the bays and shallow waters of Mississippi Sound in the vicinity of Biloxi, Mississippi.

In no other section are there such wide expanses of swamp lands as in the Gulf Coastal Plains. Out of a total area of 60,000,000 acres of swamp lands in the United States, 34,000,000 acres are in the states of Florida, Louisiana, and Mississippi. Shortly before the Civil War the federal government ceded most of these lands to the several states, but now nearly all are in the hands of individuals. Of the total area about one-fourth has been drained at an average cost of $15 per acre. As swamps contain an accumulation of decayed vegetable matter the soil is extremely rich, and when drained these lands average in value about $60 per acre, according to location. As our population increases, no doubt most of the lands of the United States will be drained and will become thickly populated.

EXERCISE 1: (Optional) The Donaldsonville Sheet, Lower Mississippi River

1. Find Donaldsonville on the map in your textbook. How far is it from New Orleans? (See note p. 10.)

2. Examine the *contour* lines of the sheet. Where is the land highest? Does the land slope toward the river or from it? Can you think of a reason why this is so? (The teacher will explain.)

3. Find small streams on the sheet. Do they flow toward the river or away from it? Why?

4. Draw a *profile* showing the surface from swamp to swamp at right angles through Lauderdale. (The teacher should make suggestions in the assignment.)

5. Why do not the extensive swamps drain? If the Mississippi breaks its banks in flood time, what do these swamps become?

6. How are the soils between the swamps and the river formed? What are such soils called? What of their fertility?

7. Where do the people in this region live? Give one reason why road-building is easy.

8. Would you like to live near Donaldsonville? Why?

EXERCISE 2: The Lower Mississippi River

1. Sketch the Mississippi from Cairo to the Gulf. Determine its approximate length.

2. Examine a good relief map, or Longmans' *New School Atlas*, and learn the altitude of Cairo. What is the river's average fall per mile? Will the current be swift? Why?

3. Keeping in mind the Donaldsonville Sheet, explain the absence of numerous large cities on the lower course of the river.

4. Select two statements from your textbook and reference books to tell the character of the river with reference to navigation.

5. Tabulate the important cities south of Cairo, stating a historical or commercial fact about each.

EXERCISE 3: The Soil Belts of Alabama

I

1. Sketch Alabama. Locate Mobile, Tombigbee, Alabama, and Tennessee rivers.

2. Using the northeast corner of the state as a center, and with a radius that reaches Birmingham, draw an arc from the east to the north boundary of the state.

3. From the same center and with a radius that reaches Gainesville, draw a second arc from the east to the west boundary.

4. Draw a southward curving line from the east boundary to the west through Troy or Greenville.

5. You have now divided the state into four belts. Label the northeast belt, *The Old Lands;* the belt south, *The Black Belt,* or *The Inner Lowlands;* the next belt, *The Cuesta;* and the one along the coast, *The Outer Lowlands.*

6. Look in your dictionary for the word cuesta (kwā′-stä). Write a terse definition of the term. The Cuesta is a ridge of hard sandstone covered with poor, sandy soils.

II

7. Look on your map to see if cities are numerous in the Cuesta. Are they more numerous in the Black Belt? The soils of this belt are very rich, as the underlying rock is limestone. What crop is grown here? Consult your textbook for the answer. How would the nature of the soil affect the density of population? Name four cities that seem to be important.

8. Review the material in your textbook to see if mention is made of minerals. In what part of the state are they found? Name two minerals obtained in the Old Lands.

9. In what belt are cities least numerous? The Outer Lowlands are swampy, sandy, and covered with forests and swamp vegetation.

10. Name the two resourceful belts of Alabama; the most populous belt.

11. For what is Montgomery noted? Compare its population with Birmingham.

12. What is shipped from Mobile? Consult your textbook for a statement concerning the importance of this port. Write this statement in your own language.

COTTON

The cotton with which we are all so familiar is raised on a shrubby plant that grows to a height of four or five feet. This plant thrives best in the subtropical regions midway between the more heated and the

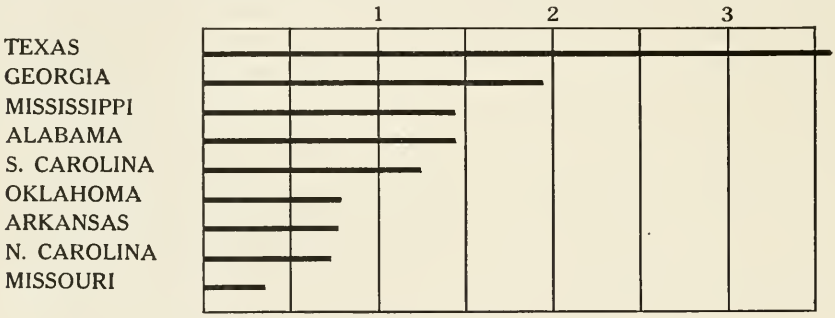

Fig. 11. — Average Output of Cotton
(In millions of bales.)

temperate zones. Long summers, with plenty of bright sunshine and an increasing daily range of temperature, are essential. If the rainfall is too abundant, the plants will produce foliage rather than cotton. In the United States cotton can be raised as far north as the thirty-seventh parallel.

The seeds are planted in rows about three feet apart by the use of a cotton planter that, in some respects, resembles a corn planter. Usually cotton is planted the last of March, blooms in June, and is picked at intervals from the first of September until about the middle of December. During this period of growth, the plants must be pruned and often topped

to prevent the growth of too much foliage. Furthermore, they must be protected from a horde of enemies that seek to destroy them.

Single stalks have been known to produce from 150 to 200 bolls, though usually they produce fewer. An average yield would be about 20 bolls per stalk. If all these bolls ripened at the same time, picking would be an easy task, for it could be done by machinery. Since, on the same plant, bolls are ripening daily throughout the entire fall, each field must be picked again and again. As soon as the bolls burst, the fibers of cotton, streaming from them, catch the wind-driven dust and sand, and are wet with dew and rain. For these reasons cotton must be picked as soon as the bolls are ripe. Most of our American cotton is picked by negro men, women, and children. Pickers are paid from 30 to 50 cents per hundred pounds of cotton, including the seed. As the cotton is picked it is placed in baskets or bags, hanging from the shoulders of the pickers. Good pickers can pick from 200 to 300 pounds of cotton in a day.

Fig. 12. — Cotton Pickers

The tedious and costly method of separating by hand the cotton from the tenaciously clinging seeds retarded for centuries the development of the cotton industry. So slow was this method of separation that a laborer could not average more than a pound of lint cotton a day. With the invention of the cotton gin, by Eli Whitney, the entire cotton industry was revolutionized. Formerly nearly every plantation owned its own gin; now the gins, which are much larger, are owned by companies, and are located at railroad stations.

The cotton fiber as it passes from the gin is immediately pressed into bales. Cylindrical bales are largely replacing the old-fashioned tortoise-back bales. These are from three to four feet long, from eighteen inches to two feet in diameter, and weigh between 250 and 400 pounds.

In the United States cotton was first grown in Delaware and Virginia. Very early the center of cotton production moved southward until, in 1860, it had reached Birmingham, Alabama. Since this time the cotton center has moved westward, until it is now west of the Mississippi River. Texas leads in the production of cotton. Georgia and Mississippi tie for second place. Other important cotton-growing states are Alabama, Arkansas, Louisiana, the Carolinas, and Oklahoma, each producing about a million bales yearly.

Through all the centuries, even up to the American Revolution, the spinning wheel and hand loom were used exclusively. During this period

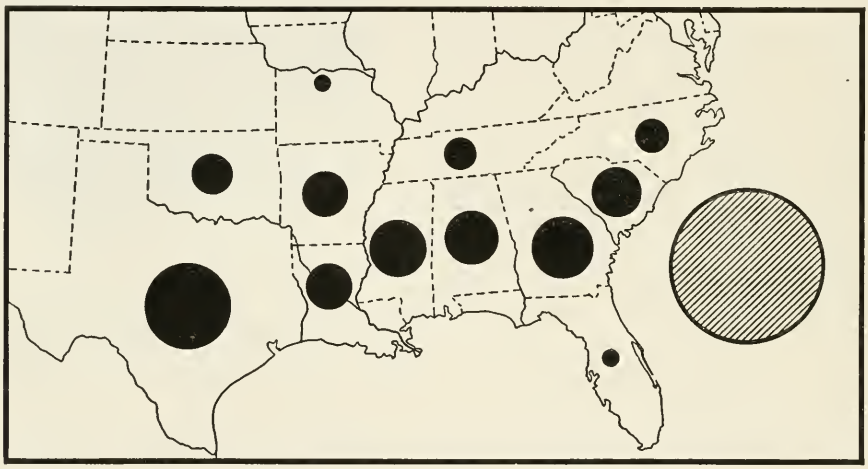

FIG. 13. — COTTON PRODUCTION (1910)

cotton mills and factories were unknown, for the cotton was manufactured in the individual homes of the people. With the advent of the factory system New England soon took the lead in cotton manufacture. Excellent water power, a soil too poor to encourage the people in agriculture, together with marked enterprise and skill on the part of the people, account for the centralization of the industry in New England. In 1860 twelve-thirteenths of all the spindles in the United States were in New England. Since then, cotton mills have multiplied rapidly, but the increase has been in the South. With its recent industrial awakening

the South has discovered that it, too, has excellent water power, that it is supplied with an abundance of cheap coal, and that it has the decided advantage of nearness to the raw product.

EXERCISE 4: Cotton-producing Areas in the United States

1. Study Fig. 13 and determine the parallel that most nearly marks the northern limit of cotton production in the United States. Why is the crop not grown farther north? Verify your inference with statements selected from your textbook.

2. What meridian most nearly marks the western limit of production? Why is the crop not grown farther west?

3. Where is "sea-island" cotton grown? What soils especially favor this plant?

4. Write in order of importance the four leading cotton-producing states.

5. Tabulate in terse sentences the three conditions that favor the growth of cotton.

EXERCISE 5: Leading Products of Texas

I

1. Sketch neatly an outline map of Texas.

2. Read carefully the descriptive matter in your textbook regarding Texas. Make a list of the leading products. In what two industries does Texas lead all the states? (See p. 126.)

3. Turn in your textbook to the map that shows the distribution of cotton in the United States. On your outline map indicate the area in Texas devoted to the cotton culture by drawing a light line around it. Fill in the area with dots, and label it *Cotton*.

II

4. Does any other state have an equal area devoted to cotton? Are you correct in inferring that Texas leads in the output of cotton? Verify your inference with a statement from your textbook or reference book.

5. Consult a map that shows the distribution of coal in the United States. Does Texas seem to have an abundant supply? Draw a line around the Texas coal fields. Fill in with light parallel lines. Do these coal fields overlap the area devoted to cotton?

6. Has Texas an abundant supply of petroleum? Consult map showing

petroleum distribution. Indicate petroleum fields with broken lines. Would you infer that in time Texas may become a center for cotton manufacture? Give two reasons for your answer.

7. Make a graph showing the relative values of the four important products of the "Lone Star State."

CANE SUGAR

Sugar cane belongs to the family of the grasses, and originally its production was confined to the valley of the Ganges. Later it was introduced into Egypt by the Arabs, and finally into Spain. The cane grows to a height of from twelve to twenty feet, is from one to three inches in diameter, and closely resembles an ordinary corn stalk. The saccharine juices are contained, not in the leaves, but in the spongy tissue of the stalks, and more especially in the lower ends of the stalks.

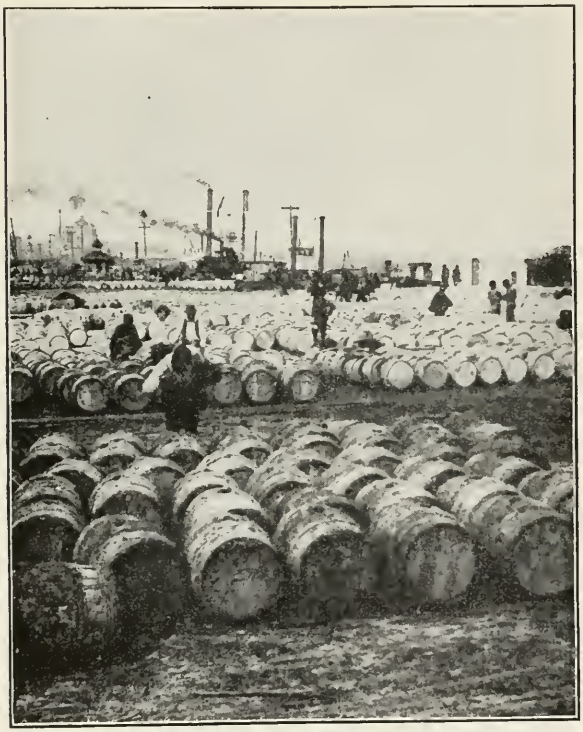

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FIG. 14. — LOADING SUGAR AT NEW ORLEANS

Sugar cane is grown most successfully in low, swampy regions, where the average temperature is 80 degrees Fahrenheit. In our own United States, Louisiana, alone, best fulfills all the conditions necessary for its growth.

The planting of a field of sugar cane is very interesting since it is *not* raised from the seed as one might expect. In fact, the stalks themselves are laid in furrows that are from five to seven feet apart. Three rows of

stalks are laid parallel in each furrow, and are carefully covered. From each joint in the stalks, shoots start, which soon appear above the ground. After eight months the cane reaches its full height, and flowers in ten months. As soon as the flowers begin to fade, cutting should begin. From these same buried stalks the shoots will grow a second and a third year, and under favorable conditions will continue to grow each year for as many as fifteen years. This process of resprouting is called ratooning, and when continued too long results in a falling off of the crop.

Cutting usually begins in October and November. The stalks are cut as near the ground as possible. After the leaves are removed, the stalks are drawn to the mill, which is likely to be near the field. Here they are placed on an endless belt that feeds them automatically into rollers that look somewhat like clothes wringers, except that they are very much larger. After passing between these rollers the crushed stalks are carried by another endless belt and fed into a second set of rollers, and so on, until in the modern mill they are passed through six and even nine sets of rollers. Each set of rollers is so adjusted as to press out some of the juice, until finally the stalks are so dry that they are burned to generate the steam that runs the rollers.

The juice that flows from the rollers is a dark, greenish yellow, and is about 14 per cent sugar. In addition to the sugar it contains small pieces of cane, dirt particles, albumoid, and salt, which must be removed in the manufacture of sugar. The juice, fresh from the rollers, is run into clarifying vats holding hundreds of gallons each. Here it is first heated to 130 degrees Fahrenheit, then milk of lime is added, after which all is heated to the boiling point. A thick scum containing most of the impurities now forms, and is skimmed off. The sirup is then placed in vacuum pans, where it boils at a much lower temperature. These pans have small glass windows through which the expert sugar boiler can detect, by the appearance of the sirup, the critical moment of crystallization. At this instant the temperature is suddenly lowered and the crystals immediately form. Through the aid of centrifugal separators, the crystallized sugar is separated from the sirup. This crystallized sugar is the brown sugar with which we are so familiar, and the sirup is the very cheap black molasses from which rum is made. By

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FIG. 15. — HARVESTING RICE IN TEXAS

dissolving this brown sugar in water and passing the solution through several filters, especially of charcoal, we get the granulated and powdered sugar of commerce.

The mills for the manufacture of brown sugar, which is the " raw sugar " of commerce, are usually located near the sugar plantations. The raw sugar is then shipped to extensive sugar refineries located in large cities. The largest refineries in the United States are located in Brooklyn, New Orleans, and San Francisco.

Cuba leads the world in the production of cane sugar for the world's commerce. She is able to do this because her rich limestone soil and moist, equable climate are ideal for the growth of sugar cane; because she has installed the most modern machinery for improving and cheapening the product; and because she is near the greatest market in the world, namely the United States. The labor on the sugar plantations is done by blacks under the direction of whites. Cuba exports to the United States $50,000,000 worth of raw sugar each year. Hawaii produces about $37,000,000 worth of raw sugar yearly. Here, single plantations include thousands of acres, and are owned by stock companies. Since nearly all the stock is held in the islands, and is owned by rich and poor alike, any decrease in the price of sugar causes widespread hardship. As in Cuba, the work is done by the natives under the direction of white managers. Here again the product is shipped in the form of " raw sugar " and is refined in San Francisco.

In the United States, Louisiana alone produces cane sugar extensively. Our entire output is 300,000 tons, of which Louisiana produces 275,000 tons. Of the remainder Texas produces 15,000 tons. New Orleans is the center of the refining industry for this district.

RICE IN THE UNITED STATES

In 1694 a ship sailing from Madagascar was driven by a storm into the Charleston harbor. Upon its departure the captain of the ship gave his newly made friends in Charleston some rice, which they planted. So large was the crop, that soon rice became one of their important products. From Charleston the industry spread southward; for the low river delta areas of Georgia, Florida, and Mississippi were well suited to

its culture, since they could be flooded at high tide, and drained at low tide.

At present the most marked expansion of the industry is in Texas and Arkansas. Formerly it was believed that only swamp lands were suited

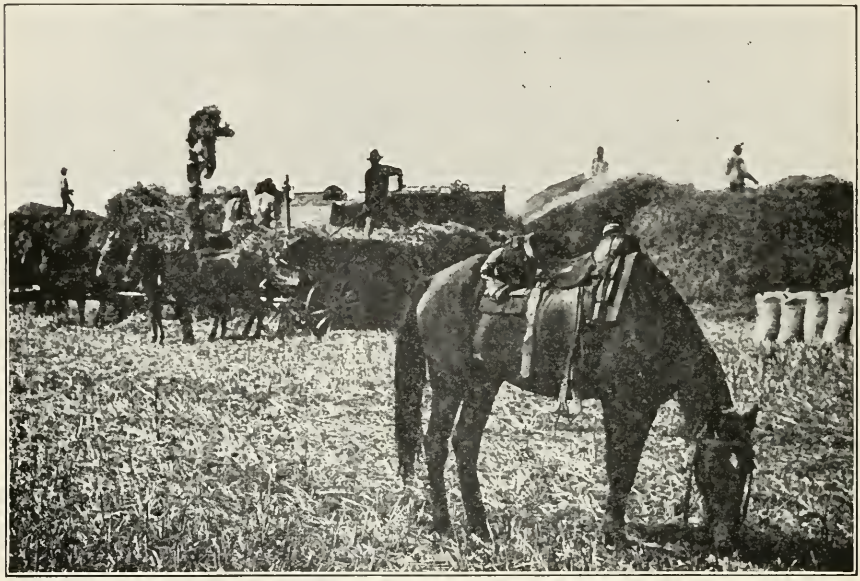

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FIG. 16. — STEAM THRASHER AT WORK IN A RICE FIELD PREPARING CROP FOR THE MILL, TEXAS

to rice culture; but since 1896 it has been clearly demonstrated that prairie lands have an advantage over low, marsh lands. Not all prairie lands are, however, suited to growing this crop, for the following four requisites must be present: "level land so the crop can be irrigated; a gently sloping surface so the land can be drained; a firm clay subsoil that will minimize seepage; and plenty of water for irrigation." Fortunately these requisites are present throughout large areas of Texas and Arkansas. These prairie lands are flooded by means of deep wells and powerful pumps. The advantage in this district is that, when the water is drained off, the solid soil becomes sufficiently dry to permit up-to-date reaping and binding machines to be used, and the rice may be thrashed

with modern steam thrashers. Though wages in the United States are about twenty times as high as in China, with modern machinery rice can be produced in this district as cheaply as in China.

Let us visit a typical rice plantation in South Carolina. The time of our visit is early in April, and we find that the fields have already been plowed and are prepared for sowing. To our surprise rice is sown broadcast, as is wheat, though we learn that on many of the plantations it is drilled in with force feed drills. In this case the drills are about ten inches apart, thus making it possible to cultivate the rice.

As soon as the rice is sown small banks of earth are thrown up about the field and water is turned in, forming a pond that covers the field. The pond remains thus for more than a week, or until the rice sprouts show their green heads above the water. The water is then drawn off and the field remains dry until a few leaves appear, when the water is again turned on and left for about a month. While flooded, the plants grow with astonishing rapidity; for, according to Chisholm, nine inches have been known to be added to the height of a plant in twenty-four hours. When the water is drawn off this time, the field is carefully hoed if the rice has been sowed in drills, otherwise it is impossible to cultivate it. After being hoed, the field is flooded from time to time until the harvest, which usually comes in August.

According to present indications the time is not far distant when we shall be able to produce all the rice we need. Only a few years ago more than half of our rice was imported; while in 1909 we produced $19,000,000 worth and imported but $4,000,000 worth of rice.

EXERCISE 6: The Cultivation of Rice

1. Consult a map in your textbook showing the distribution of rice in the United States. In what part is rice largely grown? Make a graph showing the relative outputs of the three leading states.

2. Are the soils in these states rich? By reference to a rainfall map, determine the annual precipitation. By reference to a temperature chart, find the January and July temperatures. Summarize in a paragraph the conditions favorable to rice cultivation.

3. In what states is the rice industry developing most rapidly? How are

prairie plains flooded? What advantages have prairie lands over low, swampy lands?

4. Examine Fig. 15. Where in the United States do you think the picture was taken? Why there? Do you think these men are able to raise rice as cheaply as the Chinese rice growers? Why?

5. How is rice separated from the straw? (See Fig. 16.)

6. Read carefully the preceding description of rice growing in your manual, and be able to tell the teacher in the recitation how rice is cultivated.

(Record all of your work in your notebook.)

EXERCISE 7: An Important Industry in Florida

I

1. What crop is being grown in the foreground of Fig. 17? Is this a cultivated crop?

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FIG. 17.— PINEAPPLE CULTURE IN FLORIDA

2. Describe the surface of the land. Compare the level of the land surface with that of the bay in the distance.

3. Why is the pineapple plant so called? About what is the height? How many pineapples does each plant produce? In what part of the plant is the pineapple grown? Examine the picture carefully.

4. Consult the temperature map in your textbook. What isotherm crosses Florida in January? Does this suggest frequent frosts? Do you think, however, that there might be occasional frosts? Does your textbook mention frosts in Florida?

5. What do you observe in the middle of the picture? For what are the canvas coverings used? What does this suggest concerning the hardiness of certain varieties of the crop? Why are the pineapples in the foreground not covered?

6. What, then, do you infer regarding climatic conditions suited to this industry?

II

7. Examine Fig. 18. How are the pineapples gathered? Why do you think a small track is used for transportation rather than ordinary wagons?

8. Trace one route by which pineapples might be brought from Palatka to your home town.

9. Judging from the two scenes in the pictures, what do you think of the quality of the soil? Consult a rainfall map to ascertain the annual precipitation in Florida. Write short sentences stating the soil, temperature, and moisture conditions that seem to be favorable to the pineapple industry.

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FIG. 18. — HARVESTING PINEAPPLES IN FLORIDA

PROBLEM 1: What Conditions determine the Commercial Importance of New Orleans?

1. Make a careful sketch of the Mississippi River from Cairo to the Gulf, showing the position of New Orleans.

2. Examine the lower course of the Mississippi River. Through how many mouths does the river discharge its waters into the Gulf? Why has the river

several mouths? Is this an advantage or detriment to navigation? What are the jetties for?

3. Study closely a good map of the Mississippi Valley states. How many of them seem to have water connections with New Orleans? List them neatly in this way: —

Indiana, by means of the Mississippi, Ohio, and Wabash rivers, etc.

4. List five products that are exported from New Orleans. Where is each produced? How does cotton from Mississippi and Arkansas reach Lowell and Lawrence? How does raw sugar from Louisiana reach Brooklyn? Study Fig. 14; then tell what state leads in the production of cane sugar. The scene is in what city? What do the barrels contain?

5. Are the natural conditions of New Orleans favorable to commerce? Verify from your textbook and reference book.

6. Read in your textbook to determine the sanitary conditions of the city. Is this a handicap?

7. What is the most unfavorable commercial condition with which the city has to contend? Verify by reference to your textbook.

PROBLEM 2: What Conditions favor the Development of Birmingham into a Leading City of the South?

1. Sketch an outline of Alabama. Indicate on your outline the position of Birmingham.

2. Turn to the map in your textbook that shows the distribution of coal in the United States. Do you find a coal field in Alabama? Draw a line about this field. Label it *Coal*.

3. Consult a similar map showing the distribution of iron. Is iron also found in Alabama? Draw a broken line about this field. Label it *Iron*. Do the coal and iron fields overlap? What city is located in the midst of these fields? What line of manufacture, then, would you expect to find in this city? Why? Verify your inference with a statement from your textbook.

4. Consult a map showing the distribution of cotton. Is cotton grown extensively in Alabama? How are the cotton fields related to the coal fields? The fact that there are extensive coal fields in the vicinity of raw cotton is likely to stimulate what industry? Is Birmingham a center of this industry? Consult your textbook to verify your answer.

5. Write a short paragraph in which you give the two most important lines of manufacturing carried on in Birmingham, with reasons for each.

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CHAPTER IV

THE APPALACHIAN REGION

THE PIEDMONT PLATEAU

Lying between the rugged Appalachian Mountains on the west and the low Coastal Plains on the east is a long, narrow area that is slightly rougher than a plain in places, and almost rough enough to be considered mountainous in others. This region is called Piedmont (*pied*, foot, and *mont*, mountain) because it lies at the foot of the higher Appalachian Mountains. Its elevation above the Coastal Plains at the east gives it the name of plateau.

In New Jersey the Piedmont is 30 miles wide, 67 miles long, and embraces much of the northern half of the state. It varies in elevation from 400 to 900 feet, and has a sandy soil, most of which is tilled. The scenery is beautiful. Several picturesque lakes dot this region, among which is Lake Hopatcong, a favorite summer resort.

In Pennsylvania the Piedmont is a region of beautifully rounded hills between which are broad, fertile valleys. This belt is thickly dotted with cities, among which are Allentown, Bethlehem, Reading, and Norristown.

In Maryland the Piedmont averages about 50 miles in width and includes an area of 2500 square miles. It is a belt of hills and valleys increasing in roughness as it approaches the mountains. Originally it was covered with hardwood forests which once clothed the entire Piedmont, in contrast with the pine forests of the Coastal Plains.

The Piedmont Belt passes through the middle of Virginia, where it is a rolling, hilly country, well suited to the growth of tobacco, which is the most profitable crop.

Through the Carolinas, and even throughout its entire extent, the Piedmont is a region of rich soil, well drained, and under a comparatively high state of cultivation.

The streams that cross the Piedmont are swift, shallow, and have many picturesque rapids. As these same streams cross the Coastal Plain they become quiet, and gradually widen into estuaries. The rise and fall of the tides may be noticed even to the Fall Line. So marked is the contrast between the upper and lower courses of these rivers that, while ocean steamers may go up the lower courses of the James, Potomac, Susquehanna, and Delaware, it is with difficulty that light launches ascend any considerable distance above the Fall Line.

THE APPALACHIAN MOUNTAINS

The Appalachian Mountain system extends from southern New York to central Alabama, and varies in width from 50 to 130 miles. The system includes a great central valley between two continuous ridges. East of the valley are the Blue Ridge Mountains, formed of ancient crystalline rocks that are very hard. This range is lowest in Pennsylvania, where its greatest elevation is 2000 feet. As the Blue Ridge extends southward its elevation gradually increases until in Virginia it reaches an altitude of 4500 feet above the sea. On the whole the Blue Ridge presents an even crest line with but few gaps and isolated peaks. On the east its slope is abrupt; on the west it descends gradually. Nowhere is the Blue Ridge broken or barren; but everywhere it is covered with soil, often affording good pasturage and usually clothed with forests. The summer homes of the wealthy people dot its northern extent, and the picturesque driveways add to the beauty of the scenery. Farther south are cabins and narrow stretches of rough farm land.

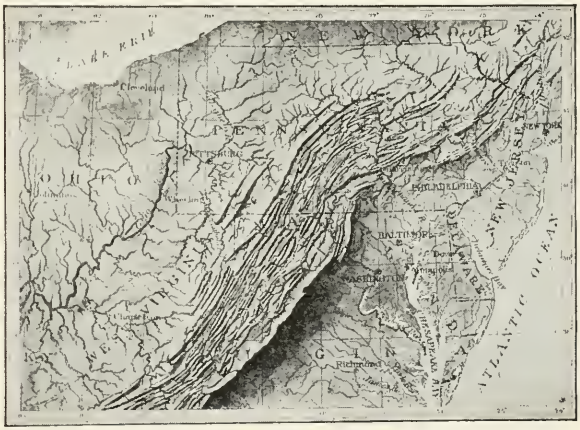

FIG. 19. — THE NORTHERN APPALACHIAN MOUNTAINS

To the west of the Blue Ridge is the Great Valley, already mentioned. This valley is practically continuous for a distance of 400 miles, and varies in width from 50 to 100 miles. It is not, as one might at first think, a *simple* valley with a single river flowing through it, but on the contrary it is a group of parallel valleys with low ridges between them. It is called a *valley* because of the high mountains on either border, and for the reason that throughout its entire extent the valley type of surface prevails. Though a continuous valley, it is known in different states by different names. In Pennsylvania it is called the " Cumberland Valley," in Maryland the " Hagerstown," in Virginia the " Shenandoah," etc.

Generally the Great Valley is underlaid with soft shale and thick beds of limestone. Since these rocks make good soils, the belt is highly productive, and farming is carried on extensively. In Pennsylvania this valley is extremely important, as it yields nearly all of the hard coal mined in the United States.

In Virginia the Great Valley is noted for its fertility and beauty. It is locally called the Shenandoah Valley and was the scene of several of the most important campaigns of the Civil War. Under General Grant's orders, Sheridan completely devastated this beautiful valley during the closing days of the Civil War.

West of the Great Valley are the Alleghany and Cumberland mountains, which together are known as the *Alleghany Front*. The position of the rocks shows that they are not true mountains but the edge of an uplifted plateau. The slope to the east is therefore abrupt, while to the west it is very gradual, passing gently into the western prairies. The steep east front was for a long time a barrier to western migration.

THE ALLEGHANY PLATEAU

The Alleghany Plateau lies west of the Alleghany Mountains and extends westward to the flood plains of the Ohio and the Alleghany rivers, and north to the Mohawk. The northeastern part of the plateau is so badly dissected that it is truly mountainous. These mountains are known as the Catskills.

At one time this region was a part of the bottom of a great sea that covered most of the central part of the United States. On this sea bot-

tom there accumulated thousands of feet of sedimentary rocks — sandstones, limestones, and shales. At this time the Appalachian Mountains were uplifted and the Alleghany Plateau also was uplifted and tilted so that it was highest next to the mountains. In Pennsylvania the eastern margin of the plateau is 2000 feet, while in West Virginia its altitude is 4000 feet. From these pronounced elevations along the mountains, the plateau slopes gradually until along its western margin its altitude varies from 500 to 700 feet above the sea. This decided slope, together with an abundant water supply, gives the streams such force that they have thoroughly dissected the plateau. For this reason West Virginia and the southeastern part of Ohio have a rough surface.

As the eastern half is much higher than the western, especially in West Virginia, the region is deeply cut by rivers and appears mountainous. The plateau is for the most part very rugged and hilly next to the mountains and gradually becomes less and less rugged until along its western margin it is a low, rolling prairie.

Not only is the eastern half rougher, but its surface rock is different. The prevailing rocks are hard sandstones, especially in the uplands, giving these areas poor soils. Only in the narrow valleys are the soils well suited to agriculture. The prevailing surface rock of the western part of the plateau is limestone, which yields excellent soils. Hence both the soil and the surface of the western half of the plateau are better suited to agriculture than the eastern.

Because of its greater elevation the plateau in West Virginia is more rugged than in Pennsylvania. So steep and sandy are the hillsides that farming is unprofitable. Much of the region is forested; and these forests should be permitted to remain, for when once removed, the soil is easily washed away.

The Catskill Mountains to the north are higher than any portion of the plateau in Pennsylvania. As these mountains do not contain mineral wealth, and since the soil is sandy, the Catskill region is not thickly settled. The only well-developed agricultural industry is dairying. The milk is taken by fast trains to New York City to be sold and delivered to the homes of the people. The region is a popular summer resort for the wealthy inhabitants of New York City.

Though on the whole the Alleghany Plateau cannot be considered important from the standpoint of agriculture, it is remarkably rich in mineral wealth. Here petroleum was first discovered, and the industry was for a long time confined to this region. An abundance of bituminous coal, so near the surface that it could be mined easily, brought the region to the front rank as a center for the smelting of iron, a distinction which it still holds. As the mineral wealth is richest in Pennsylvania, especially in the vicinity of Pittsburg, this area is most densely populated.

In general, the southern part of the plateau resembles the northern part. It is often called the Cumberland Plateau, as it lies west of the Cumberland Mountains. Like the northern part, the surface rocks are of hard sandstone and the soils are poor. The eastern half of the plateau is more abrupt. On account of the difference in slope, this region is usually more broken and rugged than the western part. In a like manner the western half, because its slope is gentle, is more "prairie-like." Since the soils in the western part are formed of limestone, they are very fertile. A part of this country, long famous for raising fine horses, is known as the "Blue Grass" region of Kentucky. Lexington is in the heart of this region. James Lane Allen's story of the "Kentucky Cardinal" finds its setting here.

The influence of good soil and smooth surface is well shown in the western part of the plateau. Here there are comfortable homes and a prosperous, educated people; but in the east, next to the mountains, the population is sparse, and the people, known as mountaineers, are extremely poor, living under the most primitive conditions. Cotton is the leading crop in the west. The eastern portion is covered with forests from which valuable lumber is obtained.

In the south the plateau is not so densely populated as in the north because there is less mineral wealth. There are few cities of importance in eastern Kentucky and Tennessee, though in the latter state Knoxville and Chattanooga are of importance for the production of finished lumber, and for their iron industries. Birmingham, Alabama, also in the plateau, is growing rapidly as it is in a rich mineral region. Iron and coal are abundant, and the resulting industries have given Birmingham the name of "Pittsburg of the South."

EXERCISE 1: Extent and Surface of the Piedmont Plateau

1. On a map of the United States, note the position of the Blue Ridge Mountains; the Fall Line. The area between them is known as the Piedmont Plateau.

2. Use the scale and determine its average width. In what state is it widest? Narrowest?

3. How high is the plateau next to the Fall Line? Near the mountains?

4. What part of the plateau is roughest? Why? What parts are still forested? Why?

5. Read the description of the Piedmont Plateau in this chapter and write a short paragraph in which you contrast the surface of the plateau with that of the Atlantic Coastal Plain.

EXERCISE 2: The Great Valley of the Appalachians

I

1. Examine a physical or relief map in your textbook and note carefully the location of the Blue Ridge Mountains. Sketch these Mountains. A few light dots may be placed on your map to show the trend of the range and to guide you in sketching it. (The Blue Ridge extends from a point just west of Harrisburg, in a well-defined range, past Atlanta into eastern Alabama.)

2. In the same manner sketch the Cumberland Mountains; the Alleghany Mountains. These are the great ranges that mark the limits of the Appalachian system. Between them is the Great Valley broken by several less important parallel ranges.

3. In the description of the Appalachians in this manual, read the reference to the Great Valley.

II

4. In what states are the Shenandoah Mountains? The Clinch Mountains? Locate carefully and sketch these ranges on your map.

5. Sketch and label the river draining the Shenandoah Valley. Between what ranges does this valley lie? Read your textbook and reference books to learn of the soils and resources of the valley. What does the valley produce? Write a short paragraph summarizing the facts.

6. Read your United States History and learn one important event of the Civil War that occurred in the Shenandoah Valley.

EXERCISE 3: Extent and Surface of the Alleghany Plateau

1. On your map draw a light dotted line from Albany, New York, to Oswego; then south through Columbus and Cincinnati to the mouth of the Wabash River; then along the west bank of the Tennessee River to the corner of Mississippi; then southeast across Alabama to the Cumberlands just south of Birmingham. The region included within this line and the Cumberland and Alleghany mountains is the Alleghany Plateau. (Its southern extent is sometimes called the Cumberland Plateau.)

2. Consult a good relief map (Longmans' *New School Atlas* will give these facts) and find the approximate altitudes of eastern Tennessee and Kentucky; of eastern West Virginia. Record in your notebook. What rivers drain the Alleghany Plateau? What will be true of the river currents? Of their channels? What, then, will be true of the surface? Review the material in your textbook and in this manual to verify your inferences.

3. Find the altitudes of eastern Kentucky and Tennessee, and of southeastern Ohio. Why will these parts of the plateau be broken?

4. Consult a rainfall map and record the precipitation of the Alleghany Plateau. Why do you think forests will thrive in this region?

5. In what parts of the plateau (east or west) do you think the forests have been largely removed? Why? Where will agriculture be best developed? Why?

7. The Great Smoky Mountains form the boundary between what two states? Sketch this range. Between the Great Smoky and the Cumberland mountains lies the Tennessee Valley. Consult your textbook and the material in this manual to learn the two most important resources of this valley. Locate Knoxville, Chattanooga, and Birmingham on your map. Review the material in your textbook and write a pertinent statement about each city.

THE COAL INDUSTRY

Coal is well called "the industrial energy of a country, the universal aid, the factor in everything we do." An adequate supply of coal is so essential to present-day industrial advancement that its scarcity or abundance in any country is a fair index of the position that country will take in the world's industrial struggle.

Peat

Peat is the first stage in the formation of coal. It is usually found in marshes or bogs, and is the result of the decomposition of various plants in the presence of moisture. If we examine a section of peat turf, we will observe that on the top there is a layer of living moss, beneath which is a layer of dead moss, whose plant structure is still recognizable; while beneath both, there is a layer of completely formed peat in which the vegetable structure is rarely distinct. The fact that the vegetable matter did not completely decompose is due to the presence of water and to the antiseptic or preserving property of peat itself. Peat is very abundant throughout the entire northern part of the United States. According to Dana, Massachusetts alone contains 15,000,000,000 cubic feet, though here as elsewhere in the United States but little use is made of it, due to the abundance of coal.[1]

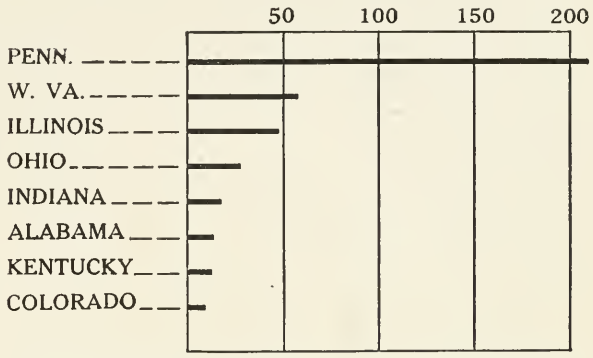

Fig. 20. — Average Output of Coal for 1908 and 1909
(In million tons)

Lignite

A bed of peat after a long time loses most of the traces of its vegetable origin, becomes more compact, and turns to a dark brown color. This, the second stage in coal formation, is known as brown coal or lignite.

As a fuel it is better than peat but not so good as the higher grades of coal. Whenever it is possible to burn lignite shortly after it has been mined, it makes a very satisfactory fuel; but when exposed to the air for any length of time, it crumbles to a powdery dust. For this reason, though very abundant, it has never entered into the world's commerce. Within recent years machines have been invented to compress lignite into briquettes, for in this form it makes a high-grade fuel. No doubt,

[1] E. S. Dana, *New Textbook of Geology.*

as the better grades of coal become more and more scarce, this will develop into an important industry.

In practically every country where there are rich coal deposits there are also extensive lignite beds; but the latter as yet have received but little attention for the reason that lignite is an inferior coal. Where lignite is the only available coal, as for example in Italy, the case is quite different, for here they have been able to get very satisfactory results from its use.

In our own country a very extensive field of lignite is found in the Dakotas, Montana, and Wyoming. The Gulf Coast region is also well supplied with lignite.

Bituminous Coal

The third stage in coal formation is bituminous, or ordinary soft coal. This variety is so familiar that its description is unnecessary. Though it was once peat, yet to the naked eye there is little trace of vegetable origin. Under the microscope, however, we are able to see traces of woody fiber. Bituminous coal makes an excellent fuel. Fortunately it does not crumble when exposed to the air; therefore, unlike lignite, it is shipped great distances.

Cannel Coal

This is a variety of bituminous coal that is being used more extensively each year. It bears somewhat the same relation to the other forms of coal that kindling wood bears to hard wood. Since it is very rich in volatile hydrocarbon,[1] it ignites easily and burns with a bright yellow flame, crackling as does kindling wood. These qualities have rendered it a popular fuel for fireplaces.

Anthracite Coal

This, the last stage in the formation of coal, is hard, brittle, black, and lustrous. The chief difference between bituminous and anthracite coal is the practical absence of volatile hydrocarbon in the latter, for it is nearly pure fixed carbon. In or near mountains we are likely to find the

[1] Consult Dictionary.

anthracite, because the mountain folding generated sufficient heat and pressure to drive off the volatile hydrocarbon. This variety of coal is not easily ignited but gives great heat.

Coal was first mined in the United States in 1760. A mine just across the Monongahela from the present city of Pittsburg was the scene of this early mining. Even though the coal was abundant and very easily mined, the industry developed so slowly that not until 1800 was coal shipped from the Pittsburg district. From 1800, however, the industry developed so rapidly that by 1899 the United States was able to take first place among the nations of the world in the production of coal. Since then she has continued to forge forward until she now produces 40 per cent of the world's output. Not including Great Britain, the United States produces more coal than all the rest of the world combined.

This coal is mined in the following six districts: (1) The Appalachian Field that extends from New York to Alabama, with a width varying from 30 to 180 miles. (2) The Northern Field that is located in central Michigan. (3) The Eastern Field that includes Indiana, Illinois, and Kentucky. [More than half of Illinois is underlaid with an abundance of excellent bituminous coal. This coal does not lie in a single layer, as we might expect, but in from nine to sixteen distinct layers that vary in thickness from one to ten feet. To reach these layers or strata we must go to a depth of 50 and sometimes 500 feet.] (4) The Western District consists of isolated basins scattered from the Mississippi River to the Rocky Mountains. (5) The Rocky Mountain area, though extensive, is best developed in Colorado. The most important field, known as the "Raton Field," lies in the southern part of the state and extends into New Mexico. (6) The Pacific Coast Field has as its center the state of Washington. On the whole the coal fields of western United States are small and scattered, and the coal as a rule is of an inferior quality, mostly lignite. Only in or near the mountains, as in Colorado and Washington, have these beds of lignite been transformed into bituminous coal. In other parts of Colorado and in New Mexico it has been further changed into anthracite by adjacent lava flows.

Wyoming, also, has important coal deposits, though Colorado leads all of the western states in the production of this valuable mineral.

EXERCISE 4: Coal

1. Read the preceding account of the Coal Industry for answers to the following questions:

(*a*) How is peat formed? Why is it not used extensively as a fuel?

(*b*) Where in the United States are there extensive lignite beds? Why has it never entered into the world's commerce? How is a high-grade fuel made from lignite?

(*c*) What advantage has bituminous coal over lignite as a fuel?

(*d*) Why is anthracite coal found in mountainous regions? Why is it so highly prized as a fuel?

EXERCISE 5: Distribution of Coal. (Based on the account of the Coal Industry in this chapter)

1. Where in the United States was coal first mined? When?

2. About how many years ago did the United States attain first place in the production of coal? What per cent of the world's coal does it now produce?

3. On an outline map of the United States indicate the location of the six great coal fields. Label each field.

4. How many states produce more than 10,000,000 tons yearly? (See Fig. 20.) Name them.

5. Compare the output of Pennsylvania with the combined output of these states.

EXERCISE 6: Anthracite Coal

1. Locate the following cities: Scranton; Wilkes-Barre; Hazleton; Shamokin; Pottsville. Indicate the position of each on an outline map of the United States. Shade a spindle-shaped area including these cities. Label *Anthracite Coal Fields.*

2. Between what rivers is this coal field located? By use of the scale determine how far this field is from New York City. Why would great quantities of coal naturally go to the Atlantic seaboard?

3. In early times the coal was shipped from the mines by a canal following the Delaware River. What city was then the distributing point for coal? Consult your map to discover if many railroads enter the coal region. By what means, then, is the coal now distributed?

a. Why has the growth of the coal industry in this region been so rapid?

b. How much does this field produce yearly?

c. Is there another anthracite coal field in the United States? Where?

PROBLEM 1: What Conditions have stimulated Dairying in New York?

I

1. Review the text material in your geography to find statements on dairying. How does New York rank with other states in dairy products? Record your answers.

2. Make a small, neat sketch of New York State in your notebook. From your textbook and reference books learn what particular parts of the state engage largely in the dairy industry. Designate the entire region by filling in with a series of carefully drawn parallel lines. (A curve north from New York through Albany, Watertown, Oswego, Rochester, Binghamton, includes the dairy region of New York.)

3. Examine carefully the best map available to learn of the surface of this region. What mountains does it include? Why is the country not generally well adapted to crop raising?

4. What use is often made of hilly lands and mountain slopes? Why? Why has the surface of this region influenced the growth of dairying?

II

5. How soon must milk and cream be marketed? What are the chief markets for the output of this region? Which portion of this region do you think ships its products largely in the form of milk and cream? Why?

6. Which portion do you think will engage more largely in the production of butter and cheese? Why? If possible, verify from your textbook. What city in this part of the region is the center of the industry?

7. Why does not the dairy industry develop in regions remote from great cities? What influence do you think New York and Boston have had on the growth of the dairy industry in New York State?

8. Write a single sentence stating the conditions that have stimulated the growth of the dairy industry in this region.

9. Use your stereoscopic views to learn something of the details of dairying.

EXERCISE 7: The Erie Canal

1. Draw an outline map of New York State.

2. Sketch the Hudson River. Indicate the position of Troy. The Hudson is navigable to this point.

3. Sketch the large tributary that enters the Hudson at Troy. Print neatly the name of this tributary.

4. Consult your textbook and the material in this chapter for facts about the Mohawk Valley. Is it deep? How was the valley formed? Is the soil fertile? In a short paragraph write the characteristics of this valley.

5. Indicate the position of Buffalo. On what body of water is it located? Draw a line from Buffalo to Troy, being careful to follow the Mohawk Valley. Using the scale in your textbook, estimate the distance between Buffalo and Troy.

6. Were conditions favorable for building the Erie canal? Why? Using red ink, draw the canal on your outline map. What river valleys does it follow? How would the fact that there were no railroads when the canal was built affect its importance?

7. Review the story of the Erie canal given in your United States History. Recite the story to your teacher.

FIG. 21. — OIL FIELDS AND GAS FIELDS OF WESTERN PENNSYLVANIA

8. Why is the Niagara River not navigable? Had it been navigable, would the Erie canal ever have been built?

9. In 1903 the people of New York State appropriated $101,000,000 for the purpose of deepening and widening the canal. When completed, this canal will be 75 feet wide at the bottom, 12 feet deep, and capable of receiving barges with a capacity of 1000 tons. Why will this enlargement make the canal again important?

EXERCISE 8: Pittsburg

1. Find Pittsburg on your map. Make a careful sketch to show its location. Examine the material in your textbook to see whether the Ohio River is navigable as far as Pittsburg. By use of the scale, estimate the distance of Pittsburg from Lake Erie.

2. What is the population of Pittsburg? Compare it with the largest city in your own state.

3. Observe that there are many smaller cities in the Pittsburg region. Indicate on your sketch the position of two of them. What is the population of McKeesport? Johnstown? Pittsburg is a distributing center for all of these cities. How does this fact affect the commerce of Pittsburg?

4. Read carefully the descriptive matter in your textbook relating to Pennsylvania. Tabulate the natural resources of the Pittsburg district. Tabulate the industries. Which industry is of most importance?

5. Why should Pittsburg manufacture plate glass? How is it made?

6. Locate Connellsville. Read your textbook to learn the industry of this place. Why should this industry be located here?

7. Look in your textbook for a picture of Pittsburg. What do you see that suggests manufacturing?

EXERCISE 9: Surface, Soil, and Industries of the Southern Alleghany Plateau

Consult the subject matter in your textbook and also the material on the Alleghany Plateau in this chapter and answer the following:

1. Where is the plateau highest? Where most rugged? Why? Where is the soil poorest? What reason can you give for the poor soil?

2. What are the people called who live in the eastern part of the plateau? How do these people earn their living? Why are they not more prosperous?

3. What parts of the plateau are most level? Why have these parts good soil? Consult the map in your textbook to see if cities are more numerous here than in the eastern part of the plateau. How can you account for this difference? Indicate on your map the location of Nashville, Memphis, and Frankfort.

4. Consult your textbook and learn the leading industry of each of the above-mentioned cities. Record neatly in your notebook.

EXERCISE 10: Tennessee

1. Tabulate the agricultural products of the state as given in your textbook. Which is of first importance? Name the minerals mentioned in your textbook.

2. Of what use is the phosphate found in Tennessee? How is it prepared for commerce?

3. In what part of the state is cotton largely grown? Locate the leading cotton market. What is its population?

4. Locate Nashville, Chattanooga, and Knoxville. Learn the leading industry of each, as given in your textbook.

5. What historic mountain is near Chattanooga? Give a brief description of the battle fought at this place.

EXERCISE 11: Kentucky and the Tobacco Culture

1. Make a sketch of Kentucky.
2. Sketch in the Tennessee, Cumberland, and Kentucky rivers.
3. Kentucky surface is underlaid with limestone rocks. Underground waters sometimes dissolve the limestone as water dissolves sugar. Locate

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FIG. 22. — TOBACCO FIELD IN KENTUCKY

Mammoth Cave on your map. What does your textbook say of this cave? How was it formed?

4. Read the material in your textbook to learn the character of the soils of Kentucky. Where is the Blue Grass region? Look for a picture of this country. What are the two leading crops of Kentucky? Record.

5. Locate Louisville, Lexington, and Frankfort on your map. Write one sentence about each city.

THE POTATO INDUSTRY

In the United States we consume annually about four bushels of potatoes per capita, which is very much less than the per capita consumption in Europe; for in some parts of Europe it amounts to 25 bushels or more.

The native home of the potato is in the Chilian and Peruvian Andes, where conditions are very similar to those found in Idaho and Colorado.

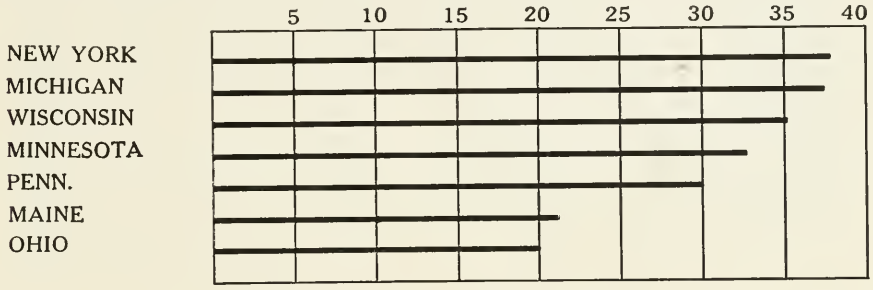

FIG. 23. — POTATO OUTPUT IN 1912
(In million bushels)

Not only is the potato a native of South America, but it was the inhabitants of this Continent that first learned its use; for when the Spanish discovered South America, they found that the potato was an important article of food. From Spain it was brought by explorers to Florida, whence it was taken to Virginia. From this small beginning the industry has expanded until potatoes are now grown in every state, and in almost every kind of soil.

The fact that we are growing potatoes in practically every kind of soil does not minimize the importance of selecting suitable soil. Our average production of but 106 bushels per acre, as against 196 in Germany and 240 in England, may suggest, among other things, the fact that we are too careless regarding the nature of the soils that we devote to potato culture. "The ideal soil for this crop should be one so light as to offer no great resistance to the enlargement of the tubers, so supplied with water as to be moist without being wet, and so rich as to furnish an unfailing supply of fertilizing ingredients." Newly cleared land, rich in

vegetable mold, is excellent. When the rainfall is abundant the soil may be quite sandy and yet the yield will be great and the quality superior.

The output of the seven leading states is shown in Fig. 23. The fact that this country is so far below most European countries in the average yield per acre has led to a great deal of speculation, and has caused many experiments to be tried. Maine, more than any other state, has made a success of potato culture, producing 210 bushels per acre, while Wisconsin produces but 119 bushels, and Michigan but 94 bushels per acre. England's average yield of 240 bushels per acre on land that has been under cultivation for centuries, should provoke the American farmer to adopt more scientific methods in potato culture.

PROBLEM 2: Why is Western New York a Great Fruit-growing and Truck-farming Region?

1. In what direction do the prevailing winds cross New York? Show by arrows on an outline map.

2. How will the fact that our Great Lakes often freeze over entirely, affect the arrival of spring in western New York?

3. Why does a late spring safeguard a fruit crop?

4. Why will the presence of Lakes Ontario and Erie insure a late fall for western New York? Why is a late fall advantageous to the gardening and fruit-growing industries?

5. Review material in your textbook to find out how New York ranks as a fruit state. What fruits are grown?

6. What cities will furnish markets for vegetables? Vegetables are perishable. How long will it take an express train running at forty-five miles an hour to reach New York from Buffalo?

7. Does your textbook contain a picture of these industries? If your school is supplied with stereoscopic views, examine pictures showing truck farms and fruit orchards in western New York.

8. What is the chief influence that favors the industries in question? Why would not central and eastern New York offer as good advantages?

9. Name three vegetables largely produced.

10. Think of one good reason why the fruit and vegetable industry should be profitable in this region.

11. Why should Rochester, New York, be noted for nurseries?

FIG. 24. — THE FLOOD, DAYTON, OHIO
(March, 1913)

PROBLEM 3: Why is the Ohio River Subject to Great Floods?

1. Name the principal tributaries of the Ohio. What *Region* do they drain? Consult a relief map and find the approximate altitudes of Pittsburg, Charleston, Columbus, and Dayton. Why do you think the streams draining the Alleghany Plateau have swift currents?

2. Examine a map to see if lakes are found in this region. Explain how their presence would lessen the likelihood of floods.

3. Is the Alleghany Plateau a well-drained region? Give one reason for your answer. How has the removal of forests increased the likelihood of floods?

4. Water often "stands" on the surface of a poorly drained country. Write a short paragraph to show that rivers draining such a country are *not* subject to great floods.

5. Examine the picture of Dayton, Ohio, which was flooded in March, 1913. Look at the electric-light posts and estimate the depth of the water in the street.

6. On March 23 and 24, two days, nine inches of rain fell in southwestern Ohio. Compare this with the annual precipitation in the Prairie Plains; in the Basin Region. Record your answers.

7. Sketch the Miami River and locate Dayton.

8. The city is built on a flood plain and is protected by a levee. Consult Fig. 24*a* and determine the height of the levee. Record.

9. How high was the water on Monday noon? Tuesday noon?

10. Considering the height of the levee, what do you infer concerning this flood?

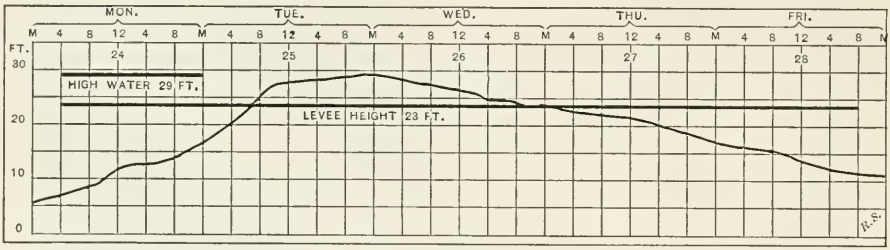

Fig. 24*a*. — Water Level, Great Miami, Dayton
(March, 1913)

11. The average fall of the Mississippi River is 7 inches per mile. In the upper course of the Great Miami, the fall is 4 feet per mile. Which river will subject the cities of its lower course to more serious floods? Why?

12. Name the states and parts of states drained by the Ohio. What is true of the drainage of this territory? Of the fall of its streams? Why, then, is the Ohio subject to great floods?

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CHAPTER V

THE LAKE PLAINS

GENERAL CHARACTER OF THE LAKE PLAINS

The Lake Plains region includes the area that drains into the Great Lakes. These plains extend northward far into Canada. As a part of the bed of the ancient sea that once occupied the central depression of North America, the Lake Plains, like the Prairie Plains, were uplifted with slight folding, forming gentle, undulated plains.

Long after, no one knows how long, the Great Glacier swept over the region reshaping its surface and giving it many of the characteristics now familiar to us.

It is likely that large lakes existed, long before the Glacial Period, where some of our Great Lakes now lie. They were probably very different in size and outline from our own Great Lakes. You must remember that glaciers are great lake formers.

The Great Glacier came very slowly from Canada, probably from about the region of Hudson Bay and Labrador. Its weight was enormous. It crushed and ground the rocks to powder and it scraped off the hilltops and pushed the sand and clay far to the south, filling valleys and depositing a thick mantle of clay, sand, and rocks — glacial drift — everywhere.

The enormous tongues or lobes forming the edge of the glacier dipped into the lakes, as they then existed, and scooped them out, changing their sizes and shapes greatly. The Great Lakes, therefore, are largely of glacial origin.

During the glacial period the Great Lakes were much larger than at present. The glacier coming from the north so dammed the St. Lawrence River with ice, that several of the lakes overflowed toward the south.

At one time Lake Erie overflowed eastward and her waters were carried by the Mohawk and Hudson rivers into New York Bay, and the Maumee and Wabash were one river that drained the west end of Lake Erie. A close study of the map, noting especially the directions of St. Joseph's and St. Mary's rivers, is evidence of the opposite direction once pursued by the Maumee. After the glacier receded, a slight uplift of the earth's crust parted the old Maumee-Wabash at Fort Wayne and caused the drainage from this point to flow back to Lake Erie. The old abandoned channel from Fort Wayne to Huntington was later converted into a canal.

So, too, Lake Michigan's waters discharged southward through the Des Plaines and Illinois rivers, and Superior sent its waters southward through the St. Croix and Mississippi rivers.

The soils of the Lake Plains are of two kinds: near the present margins of the lakes, the soils are of fine materials, well sorted sands and clays, swept into the once enlarged water bodies, and deposited near shore, in their shallower waters. Such soils are often called "lacustral." Further back the soils are of glacial origin and are usually spoken of as "glacial drift" soils. Unless too sandy, both kinds of soils are productive.

The Lake Plains were originally well forested, northern Michigan, Wisconsin, and Minnesota abounding in magnificent pine forests, now largely removed for their valuable lumber. Southern Michigan and Wisconsin were forested with deciduous trees, *e.g.* oaks, walnuts, maples, and elms, largely used in making furniture.

The tempering effect of the lakes makes Michigan and New York excellent fruit countries. Much of the Lake Plains is under excellent cultivation, being devoted largely to the growth of cereals.

The region, too, is valuable for its minerals. Saginaw, Michigan, produces large quantities of salt. The great copper mines of Keweenaw Point in the northern peninsula of Michigan and the celebrated Mesaba Range north of Duluth, Minnesota, furnish immense supplies of ore to the industries.

As a result of the forests, the valuable mineral deposits, and the cheapness of water transportation, the lake cities are busy manufacturing centers.

EXERCISE 1: The Great Lakes

I

1. Make a neat sketch map of the Great Lakes and the St. Lawrence River. Print in the proper place the name of each lake and each connecting body of water.

2. The water level of Lake Superior is 602 feet above sea level. The water level of Lake Huron is 582 feet. Write these numbers on your drawing. How much does the water fall in going from Lake Superior to Lake Huron? Look carefully at your map. Through what river does Lake Superior discharge into Lake Huron? About how long is it? Will the fall of water be rapid? Will the current be swift? How do vessels avoid any difficulties? Look in your textbook and reference books for a picture of the Soo Canal. Try to find a statement in your textbook concerning its importance.

3. The water level of Lake Erie is 573 feet; of Lake Ontario, 247 feet. How many feet does water fall in flowing through the Niagara River? Consult your geography to find the height of Niagara Falls. Compare their height with the difference in the levels of the two lakes. How do vessels pass from Lake Ontario to Lake Erie?

II

4. By use of the scale of the map, find the approximate length of the St. Lawrence River. Recall the height of Lake Ontario. Find the average fall per mile. If the fall is not equally distributed, what will be the result? Look in your textbook for a picture of the St. Lawrence River. Does it show rapids? Read also the material in your textbook. If rapids are mentioned, find the name applied to them. How do vessels avoid rapids in streams? Record neatly all of your answers. By means of neatly drawn double lines, show the locations of all canals mentioned. For this purpose use red ink.

5. From the statistical table in your textbook determine the combined area of the Great Lakes. Compare their area with that of your own state. Why cannot large lake vessels pass from Lake Erie to Lake Ontario? What large city in New York is the eastern terminus of lake traffic? What is the population of this city? What waterway connects it with the Hudson River and the Atlantic Ocean?

6. Why should explorations and settlements have been made at an early date along the Great Lakes? Find names that suggest the nation.

III

7. What city is the *western* terminus of lake traffic? In what state is it located? Compare the population of this city with that of the eastern terminus. With the aid of the scale in your textbook determine the distance between these two cities.

8. Consult your textbook and make a list of the leading agricultural and mineral products carried on these lakes.

9. Consult your textbook for the picture of a "lake boat." Examine it carefully. Be able to describe it to your teacher during the recitation.

EXERCISE 2: Location and Industries of the Lake Plain Cities

I

1. Make a sketch map of Wisconsin, Michigan, northern Illinois, and northern Indiana. Sketch the principal rivers.

2. In what part of Michigan and Wisconsin are cities most numerous? Locate six on your map. Account for their location.

3. Indicate the location of the capital of each state. Look up the population of each. Think of one reason why these cities are not large. Record.

II

4. Name the largest city in Wisconsin; in Michigan; in Illinois. Consult the subject matter in your textbook for statements regarding the industries of each one. Record your answers.

5. Why is Detroit favorably located for the manufacture of automobiles and stoves? Why is Chicago favorably located to serve as a market for grain and live stock? Why does the location of Milwaukee favor the manufacture of lumber and malt liquors?

6. Study a railroad map of United States, and discover some reasons why Chicago has become so important as a railroad center. State at least two reasons.

EXERCISE 3: (Optional) A Study of a Glaciated Surface (St. Paul Sheet[1])

I

1. Locate this area on a map in your textbook. Name the two rivers shown on the sheet.

[1] See page 10.

2. About how many lakes do you think there are south of the Mississippi and Minnesota rivers? About what is the length and width of an average lake?

3. Read the material on the Lake Plains in this chapter and tell how these lake basins were formed.

4. In what way do these lakes benefit the region? How do they injure it?

II

5. Locate a hilltop. How do the contour lines show these hilltops? Find the heights of two or three of them. How many such hilltops can you find? How were the hills formed?

6. Locate the Falls of Minnehaha. Count the number of contour lines that cross Minnehaha Creek and, from this number and the number expressing the contour interval, find the height of the falls. (See Frontispiece.)

7. Write a short paragraph in which you describe the surface and drainage of a glaciated area as shown in the St. Paul Sheet. Why is the region picturesque? About how high are the bluffs along the rivers? About how high above sea level is St. Paul?

PROBLEM 1: Southern Michigan is a Good Fruit Country. Fruit is not profitable in Wisconsin in the Same Latitude. Why the Difference in Favor of Michigan?

I

1. Make a neat outline map of Lake Michigan and the four states that lie on its borders.

2. On the map just made show by arrows the general direction of the prevailing winds.

3. What *one* weather condition is the greatest peril to fruit crops? Write one sentence about the temperature of the water of Lake Michigan in April and May. Will warm winds be cooled in crossing the lake? Will spring advance slowly or rapidly in southern Michigan? Why? Show how this condition is an advantage to the fruit crop.

4. Warm winds from the southwest often blow over Illinois and southern Wisconsin early in March and April, causing high temperatures. How would such temperatures affect fruit buds? In Wisconsin frosts often occur in May. How, then, are warm periods followed by cold disastrous to fruit?

II

5. Write a paragraph showing how the conditions mentioned in "4" may be disastrous to fruit.

6. Which side of the lake is cooler in spring and summer? Warmer in fall and winter? Show how the lake regulates or equalizes the temperature of southern Michigan.

7. Summarize the statements found in your textbook concerning the fruit industry in Michigan.

8. Write a paragraph showing the advantages of southern Michigan over southern Wisconsin for fruit growing.

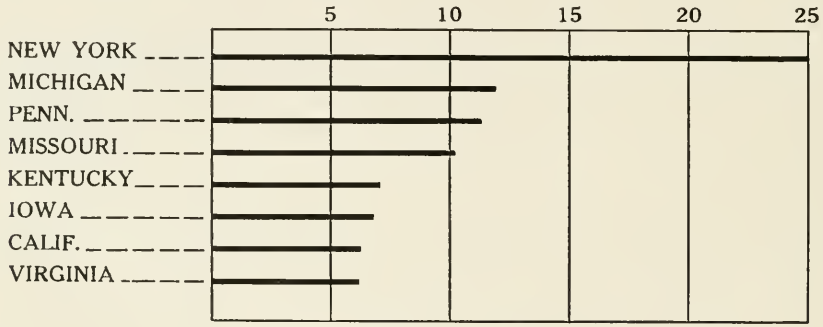

FIG. 25.— APPLE CROP IN 1912
(In million bushels)

EXERCISE 4: Apple Output of Leading States

1. Consult Fig. 25 for answers to the following:

   a. How many states yearly produce more than five million bushels of apples?

   b. Name four states that produce about the same amount. Compare the combined output of these states with that of New York.

   c. Why do you think Michigan produces apples extensively while Wisconsin does not?

   d. In what part of Missouri are most of the apples grown?

   e. The output of New York is at a standstill while that of California is rapidly increasing. Account for this.

THE DAIRY INDUSTRY

Dairying is a form of intensive farming. Whenever land is cheap and labor scarce, as in Wyoming and Texas, grazing and not dairying is the chief agricultural industry. Under these conditions the typical scene is the cowboy with his herd of large beef cattle.

As population becomes more dense and hence land more scarce, cattle ranches give place to large wheat fields, provided the land is suited to agriculture. This change has taken place in Kansas, Nebraska, and the Dakotas; for, only a few years ago, these were the leading grazing states, whereas to-day they are the centers of wheat production.

Whenever population becomes still more dense, a third change takes place, — the raising of cereals on a large scale gives way to dairying, which requires more labor but yields a greater return per acre. This change has taken place in many parts of the United States, but more especially in Wisconsin, Iowa, and Illinois. Thus we see that the grazing areas are being pushed farther west and becoming more restricted. The result is a decrease of 28 per cent in the supply of beef cattle during the past twelve years. This to a large extent accounts for the increased cost of meat.

The important dairy products are milk, butter, and cheese.

Milk

The amount of milk consumed yearly is increasing greatly on account of the rapid growth of cities. In 1800 but 4 per cent of the people of the United States lived in cities; now 44 per cent live in cities. New York City alone requires 1,000,000 quarts daily. This milk is taken by farmers to railway stations, whence it is carried by special express trains to New York City. There are 500 stations that receive milk for this single city. One hundred years ago there were but six cities in the United States having a population of 8000; now there are 600 such cities, all of which must be supplied with milk.

Butter

The United States produces 1,500,000,000 pounds of butter yearly, which is about 20 pounds for every man, woman, and child. Down to

about 50 years ago most of the butter was made "by hand" on the farm by the farmer's wife or some member of his family. From 1861, when the first creamery was built in Orange County, New York, the factory plan has grown up rapidly. Iowa, with her 800 creameries, leads the states in the production of butter. Wisconsin ranks second, with New York third.

Cheese

Though the people of the United States lead the world in the per capita consumption of butter, they use but little cheese as compared with the Europeans. Until recently they gave little thought to the best methods of manufacturing cheese, and were easily outclassed by Canadian and European cheese makers. At present the industry is developing rapidly, and American cheese ranks with the best.

Wisconsin produces more cheese than any other state. Other states that produce extensively are New York, Ohio, Michigan, and Pennsylvania.

PROBLEM 2: Why has Wisconsin become a Leading State in the Dairy Industry?

I

1. Consult a good map showing Wisconsin. In what region is the southern part of the state? The eastern and northern parts?

2. Enumerate the grains grown in Wisconsin. Does the corn belt extend into the state? What grains are used in feeding cattle and milch cows? Other things being equal, will a region that produces grain offer advantages to dairying? Why? In this particular case will Wisconsin have an advantage over New York? Over Iowa? Why?

3. Is it likely that the lowlands in the lake region are under cultivation? For what purpose are such lands used?

4. Southwestern Wisconsin is quite rolling. What use will be made of the steeper slopes? These soils come from decayed limestones. Will they be fertile? Blue grass thrives well. State why this region is favorable for dairying.

II

5. Name large near-by markets for Wisconsin dairy products. Has Wisconsin an advantage over Iowa in this respect?

6. Immigration to Wisconsin has been rapid. Many Swiss people have settled in the state. Would these people encourage dairying? Why? What phase of the industry? Why?

FIG. 26.— DAIRY BARN AND SILO, WISCONSIN

7. Professor Babcock of the Wisconsin Agricultural College made a famous invention. What was it? How did it affect the dairy industry? Can you think of other ways that agricultural colleges have caused the dairying industry to grow?

8. Examine Fig. 26. What is the building at the left called? With what is it filled? How? Write a paragraph answering the questions.

9. Is silage used in fattening beef cattle or for feeding milch cows?

10. Graph the four leading dairy states in order of importance.

PROBLEM 3: What Conditions have contributed to the Development of Minneapolis into the Greatest Flour Milling City in the World?

I

1. Make one sketch which will show the outlines of the three states, North Dakota, South Dakota, and Minnesota.

2. On this map draw the Mississippi, Missouri, Minnesota, and Red rivers. Show the exact location of Minneapolis and St. Paul.

3. Read in your textbook carefully to see if mention is made of falls in any of these rivers. Where? What is the name of the falls? What advantage to manufacturing do waterfalls offer? Make a check in your map to show where these falls are located.

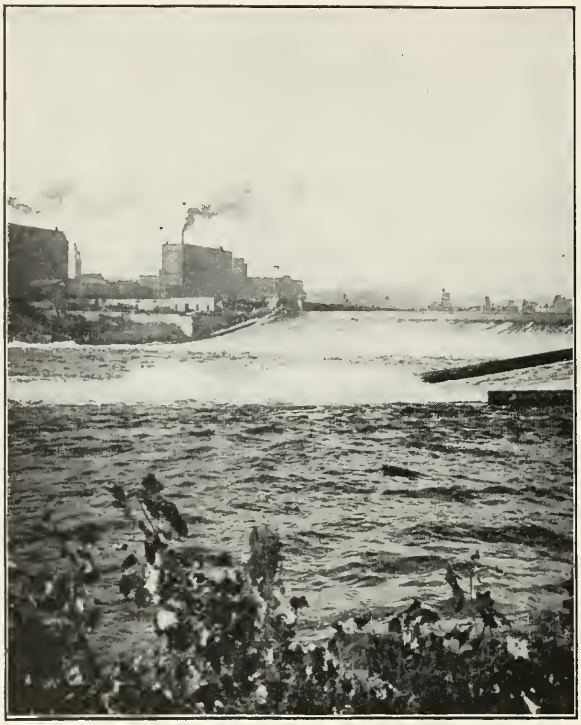

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FIG. 27. — ST. ANTHONY FALLS WHERE POWER IS PRODUCED FOR GREAT FLOUR MILLS, MINNEAPOLIS

4. Study the picture, Fig. 27, carefully. What river is shown? Name the Falls. What are the large mills shown in the background? Why located at this point? Why do you think the water power is good? What is a *turbine?* (See Dictionary.) In what city is this scene located?

5. Read the subject matter in your textbook on Minnesota. Is any mention made of "Lake Agassiz"? A considerable strip of land on each side of the Red River was once covered by this lake. Shade the Red River valley in light yellow. Consult your textbook and the material in this manual to find statements describing the soils now found in this old lake bed. Write a sentence telling how these soils were formed.

II

6. What crop is extensively grown in these states? In what part of the United States is the population densest? In what general direction will a food product produced here be shipped? Why? Will wheat shipped from the north-

west be likely to pass through the Twin Cities? (Consult a railroad map if possible.)

7. Consult your textbook to find out the head of navigation of the Mississippi River. Where is it? Are navigable waters to the south of this point an advantage to the milling industry? How?

8. Do you think natural conditions at Minneapolis have favored the milling industry? Name three such conditions.

9. Two of the great milling companies are located in Minneapolis. Find out the names of these two companies.

NOTE. — The Washburn-Crosby Company often sends very attractive exhibits of its products to schools that are interested. Some pupil in your class should write for particulars.

PROBLEM 4: Why has Grand Rapids become such an Important Furniture Center?

I

1. Make a sketch of the southern peninsula of Michigan.

2. Draw Grand River and locate the city of Grand Rapids.

3. How do you think the city got its name? Do you think it has the advantage of good water power? Verify if possible.

4. What trees furnish good wood for the manufacture of furniture? Make a list of at least four such woods.

5. Study a forest map of the United States. Study carefully your textbook and geographical readers and make a list of the trees that grow in southern Michigan. Compare with your answer to "4".

II

6. Where do you think Grand Rapids finds markets for her furniture? Name three places and give reasons for your selections.

7. Do you think the nearness of Grand Rapids to Chicago is an advantage to the furniture industry? State two such advantages. What is a "distributing center"?

8. Read the material on Michigan in your textbook and note carefully what is said of her industries and of Grand Rapids. Write three good sentences to tell why Grand Rapids is a noted furniture center.

9. Give two reasons why Sheboygan, Wisconsin, is noted for the manufacture of chairs.

THE IRON AND STEEL INDUSTRY

So ancient is the use of iron that it is mentioned in the Book of Genesis, and is found amid the ruins of the pyramids of Egypt. Though its use dates from the very remote past, the marvelous development of the iron and steel industry is so recent that its beginning is within the memory of those now living.

Iron is rightly called the metal of modern civilization, for its use has ever marked the progress of nations. So true is this, that if we know the amount of iron that a nation consumes, we can easily determine its position in the scale of civilization. Accordingly, Asia uses about five pounds of iron per capita yearly, South America fifteen pounds, while Europe and the United States use four hundred pounds each year for every man, woman, and child.

All that goes to make up present-day civilization is dependent upon the development of the iron industry. The modern steel rail has made possible the construction of locomotives of 125 tons, that draw loads of a half a million tons each. Cheap steel has fairly revolutionized ocean commerce as well. Modern commercial buildings, such as the Woolworth Building in New York City, which towers to a height of 750 feet and houses 10,000 people, would be impossible without modern steel as a framework. As only steel is hard enough to be used in making machines, modern machinery with its marvelous effectiveness is entirely an outgrowth of the development of the steel industry.

Kinds of Iron Ore

Pure iron, which is silvery white, exists in but a very few places and in extremely small quantities. Our iron is derived from "ores," or compounds of iron and carbon, or iron and oxygen. Of these ores we have *Hematite*, which is a compound of iron and oxygen and is hence spoken of as an oxide of iron. It is red or brown in color, and furnishes more than half of all the ore mined. *Magnetite* is another compound of iron and oxygen, but it contains more oxygen than hematite. It is nearly black, and is sometimes called "lodestone," for it is naturally magnetic. A third kind of iron ore is called *iron carbonate*. This is a

compound of iron and carbon dioxide. Usually it is grayish, varying to red, and is crystalline with crystals that resemble spears. It is mined most extensively in England.

How Iron is Mined

With the exception of the Mesaba Range in northern Minnesota, most of our iron is brought from hundreds of feet beneath the surface. In the Mesaba district the ore lies so near the surface that the entire cover, some forty feet of rock and earth, is removed. In this case all the mine we have is a large, open, quarry-like pit, into which whole trains of empty cars easily enter to be loaded. The ore of this region is a red hematite which is so soft and brittle that it would remind you of badly decayed rock. Since the ore is soft it is easily blasted, and, when thus loosened, is quickly loaded on to cars with huge steam shovels, so large that each shovel at a single bite takes up about six tons. Some idea of the ease with which the ore can be thus mined is suggested by the fact that a single shovel has loaded 170,000 tons in twenty-six days, or at the rate of 6500 tons a day, at a labor cost of four cents a ton. The fact that open pit

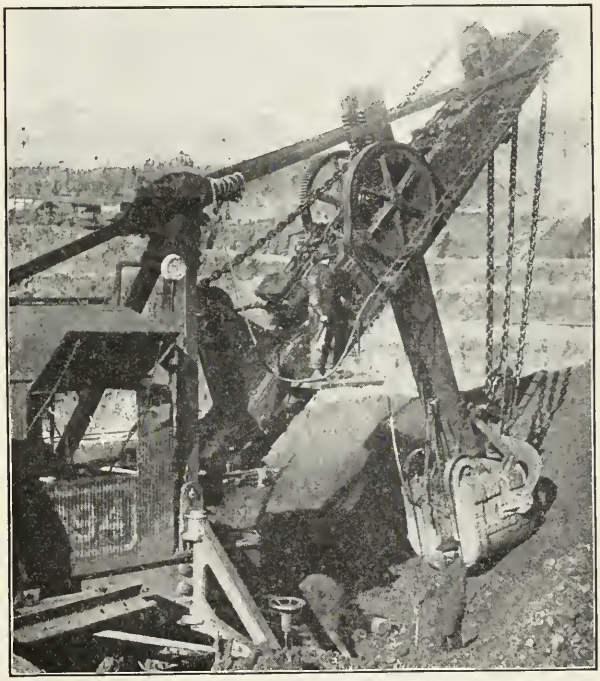

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Fig. 28. — Surface Mining, Mesaba Range, Minnesota

mining is so very cheap has given the Mesaba Range a decided advantage; in fact, it has put many of the underground mines out of business, which in all likelihood will have to remain closed until the Mesaba ore is exhausted.

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FIG. 29. — UNDERGROUND MINING, SCRANTON, PA.

SMELTING OF IRON

The simplest smelter, a bed of coals in which the ore is buried, was used by people in very early times. These smelters were usually located in openings between ledges of rocks, where there would be a strong air current to fan the fires.

Now the ore is smelted in blast furnaces. These furnaces, which are about ninety feet in height, are made of heavy boiler steel plates and lined with fire brick to a thickness of three feet. An inclined track, upon which self-discharging cars carry coke, iron, and lime, leads to the top of each furnace. First a layer of coke is dumped into the furnace, then a layer of ore, and finally one of limestone, this order being repeated until the furnace is filled. When filled, the "hot blast" is turned on. By this we mean that the air, before being introduced into the furnace, is heated to a temperature of from 1200 to 1800 degrees Fahrenheit. Beside each furnace is a large, upright cylindrical blast oven for heating the air used in the hot blast. From the oven the air is forced in at the bottom of the furnace.

Powerful engines drive the air into the furnace with such force it can be heard for a long distance. The hot blast thus driven through, fans the coke and causes it to burn with a fury that raises the temperature of the entire mass within the furnace to 2000 degrees Fahrenheit, reducing it to a liquid. When it is entirely melted, the lime, cinders, and other impurities unite to form the " slag," which, due to the fact that it is lighter than the metal, rises to the top and may easily be drawn off. The lime is used for the reason that it helps to form a liquid, hence easy-flowing, slag. The carbonic acid from the limestone, uniting with the iron, forms " pig iron." Since this is heavier than the slag, it is drawn off at the bottom. About 100 tons of " pig iron " are obtained at each drawing off, and as this occurs every four hours, a blast furnace produces about 700 tons in 24 hours. Formerly it required six tons of coal to smelt one ton of iron; now less than one ton of coke is required.

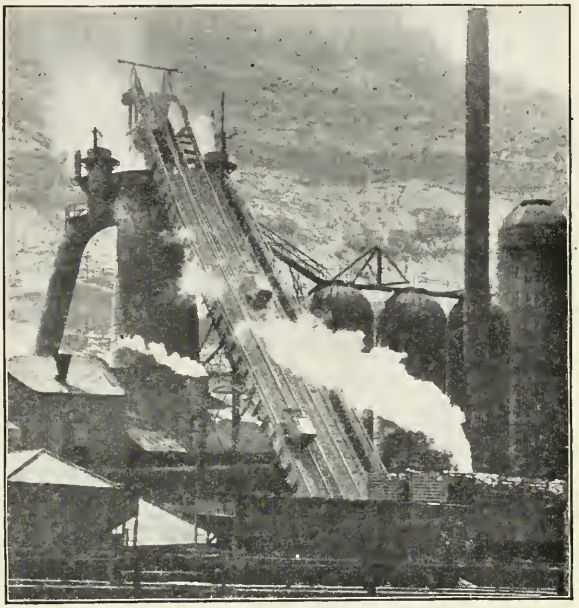

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FIG. 30. — BLAST FURNACE, PITTSBURG

How Iron is made into Steel

The molten metal, without cooling, is carried in ladles from the blast furnace to the Bessemer converter. This converter is pear-shaped. It is much smaller than the blast furnace, being only about eight feet in diameter and fifteen feet high. It is so placed on pivots that it can be tipped to a horizontal position when emptied. About fifteen tons of molten metal can be poured into the converter at a time, and remain in

the converter for from eight to twelve minutes. In the bottom of the converter there are holes through which a blast of very hot air is driven with all the force that a four or five thousand horse power engine can produce. The oxygen in this hot air first burns the silicon out of the iron, after which it attacks the carbon. Strangely enough the carbon will not burn until all the silicon has been consumed. With both the silicon and carbon removed, the iron in the converter is worthless; for, to be of any worth, the iron must possess carbon and manganese, *but in just the right proportions*. Since the quality of the steel depends upon its having just the right amount of carbon, the only way to get it in its right proportion, is first to burn out all the carbon, and then add the desired amount. The advantage of the converter is that it is a cheap method of burning out all the carbon so that a definite amount can be added. If steel contains too much carbon, it is brittle; if too little, it is soft.

Before the invention of the Bessemer converter steel cost $250 per ton. The fact that it was so expensive was not because there was a lack of iron to be made into steel, but because the process of making steel was, in itself, so expensive. The converter at once so cheapened this process that now steel can be manufactured for $20 a ton. Just as the cotton gin revolutionized the cotton industry, so the Bessemer converter has revolutionized the steel industry.

Forms of Iron

Iron is used in three forms, namely, cast iron, wrought iron, and steel. Cast iron is made by pouring the molten metal from the blast furnace into properly shaped sand molds. Just before the liquid becomes solid it expands slightly, so that it fills every niche of the mold, perfectly reproducing the pattern. Cast iron contains about 5 per cent carbon, is brittle, and crystalline. Articles that do not require great strength, as for example stoves, are made of cast iron.

To form wrought iron, the molten metal from the blast furnace is stirred or "puddled," which process burns out the carbon. Wrought iron may be easily bent, drawn into wire, or beaten into sheets.

Steel is like wrought iron, save that spiegeleisen, containing the proper amount of carbon and manganese, has been added to the liquid mass. Steel has the further difference that it can be " tempered." For example, if we heat steel white hot and thrust it into ice water, it becomes as hard as it can be made. If cooled very slowly, it is as soft as it is possible to

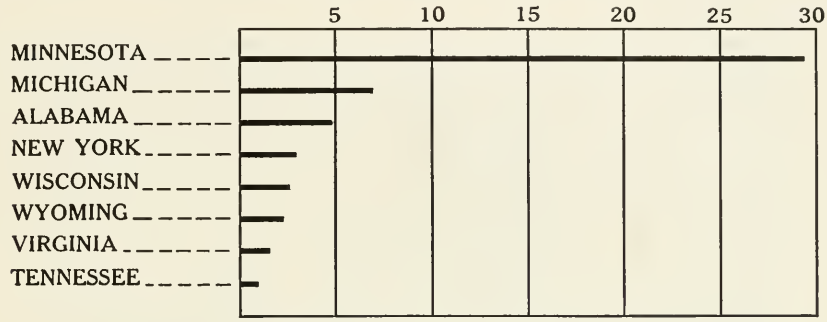

FIG. 31. — OUTPUT OF IRON, 1910
(In million tons)

make it. Between these extremes all degrees of hardness may be obtained. The fact that it is possible to adjust the hardness of steel to any use to which we may desire to put it, causes it to be used more widely than any other metal.

EXERCISE 5: Two Methods of mining Iron Ore

1. Judging from Fig. 28 what power do you think lifts the ore? Do you think this ore is near the surface of the ground? Why is this an economical method of mining? It is called open-pit mining.

2. Why do you think the method of mining shown in Fig. 29 is so much more costly than open-pit mining? How, then, did the opening of the Mesaba open-pit mines affect the other mines of the country, most of which are underground mines?

3. From Fig. 31 learn the number of states that produce more than a million tons of iron ore yearly. About what is the combined output of the states? What percentage of the total output is mined in Minnesota?

4. Remembering that Fig. 28 shows the method of mining in Minnesota, account for the fact that this state leads in the production of iron ore. Do you

think that it is quantity of ore or cheapness of mining that gives Minnesota the lead? (See account in this chapter.)

EXERCISE 6: The Making of Iron and Steel

1. Why is steel called the metal of modern civilization? (See "The Iron and Steel Industry.")

2. What does Fig. 30 show? About how large is a blast furnace? Of what is it made?

3. In filling a blast furnace what three things are put into it? Of what use is the coke? The limestone? What is meant by the "hot blast"?

4. Describe the Bessemer converter. Why is the molten iron from the blast furnace put in the converter? What change takes place in the molten iron while within the converter? What effect did the invention have upon the iron industry?

5. How is cast iron made? For what is it used? How does wrought iron differ from cast iron? How does steel differ from either cast iron, or wrought iron? Why is steel so much more valuable? Why can it be used for so many purposes?

EXERCISE 7: Distribution of Iron Ore

1. Consult Fig. 31. What is the combined output of the states shown?

2. Compare the output of the leading state with that of the other states combined. What advantage has this state over the others? (See material in this chapter.)

3. Sketch Minnesota. Indicate the position of the Mesaba Range. From this range the ore is taken to what lake port? Indicate the position of this city. Consult your textbook for statements regarding its industries.

4. Name four cities to which the ore is taken to be smelted. Trace the route a ship would take from Duluth to Cleveland, naming all the bodies of water through which it would pass.

EXERCISE 8: Copper Mining in Michigan

1. The picture, Fig. 32, shows the shaft of the *Calumet and Hecla* mine. Locate Calumet on your map. On what peninsula is it located? Learn to spell this name. This mine bears the reputation of being "the richest copper mine on earth."

2. Read your textbook to see what mention is made of mines at Calumet. Are the mines shallow or deep? Of what use is the *shaft?*

3. Count the cars just loaded with the copper ore. Consult your textbook to see if this copper is referred to as *native* or *pure*. Explain.

4. Comment on the cost of mining and lifting copper from great depths. Show why low-grade ore could not be mined at Calumet.

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FIG. 32. — COPPER ORE JUST HOISTED FROM THE SHAFT, CALUMET AND HECLA MINE, MICHIGAN

5. Compare the output of copper in Michigan with Montana's output. Which ore is purer?

6. How does our "Electric Age" affect the demand for copper? Name two properties of copper that make it especially useful.

PROBLEM 5: Why are the Lake Erie Cities engaged largely in Iron Manufacture?

I

1. Make a sketch of Ohio.

2. Sketch the rivers that flow into Lake Erie. Print their names neatly on your map. Locate Detroit. State her leading manufactures.

3. Locate Toledo, Sandusky, Cleveland, and Ashtabula.

4. Which cities are at the mouths of rivers? Of what advantage is this?

5. Consult your textbook to find statements about the cities in question. Summarize the book statements concerning each city.

FIG. 32*a*. ONE OF DETROIT'S BIG INDUSTRIES

II

6. In connection with what cities is the iron industry mentioned? Where does the ore come from? The coal? Which commodity is brought the longer distance? By the scale on your map estimate the distances and record. Why is the smelting done relatively near the coal fields?

7. Consult your textbook to see if Duluth (Minnesota) manufactures iron goods. The most populous portion of United States lies in what general direction from Duluth? (Consult population map.) How will density of population affect the demand for iron and steel goods? If iron *were* manufactured in the Mesaba district, in what general direction would the output move? Show why there is little or no loss in shipping ore to the Lake Erie cities for manufacture. The Cambria Steel Company of Johnstown, Pa., owns mines in the Mesaba district. Show why they can manufacture profitably at Johnstown.

8. Read a description of the iron industry in your geographical reader. Study the stereoscopic views showing any phase of the industry.

9. Write a paragraph to show why the Lake Erie cities manufacture iron goods.

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CHAPTER VI

THE PRAIRIE PLAINS

GENERAL CHARACTER OF THE PRAIRIE PLAINS

The region known as the Prairie Plains includes extensive areas which lie south and west of the Great Lakes. These plains are called *prairies* because they are usually treeless. Some writers think that the whole region was once forested, and that the Indians destroyed the forests with fires, in order to obtain pasturage for the herds of buffaloes from which they obtained much of their food. Other writers contend that the region has never been forested except along the streams that drain it. The only forests that are found to-day are the narrow fringes of woodland along the rivers.

The surface of the Prairie Plains is generally level. Here and there it is slightly undulating. Portions near the rivers are often dissected and rough through the process of erosion. The altitude varies from 300 to 650 feet.

The Prairie Plains were once a part of the bed of a great interior sea which extended from the Arctic Ocean to the Gulf of Mexico. This sea is sometimes called the Paleozoic Sea, so named because it existed a long time ago; for the animal remains found in the limestone and sandstone rocks of the old sea bed belong to very ancient animals. You have learned that the crust of the earth often rises and sinks. The bed of the old sea which once completely separated the Appalachian region from the Rocky Mountain region was slowly lifted, causing the waters to retreat northward and southward. There was no extensive crushing or folding of the rocky sea bed similar to that about which you learned in your study of New England and the Appalachian region. Hence in time the sun shone and the rains fell on thousands and thousands of square miles of very level or slightly undulating land.

Little, indeed, does man know of this area until after the invasions of the great glaciers which did much to determine the present surface of the region. Practically all of the Prairie Plains have been covered with ice, some portions having been invaded several times. These

Fig. 33. — Stock Farm, Driftless Area, Wisconsin

great sheets of ice started far to the north and slid slowly southward, their great lobes pushing and crowding each other as if each was eager to go in as straight a line as possible toward the southern point of Illinois. These great masses of ice passed over large areas of sandstone and limestone, crushing, grinding, and mixing them, and sweeping the material thus formed far to the south, where it was spread out over the plain in a somewhat even mantle of what is now known as glacial drift. Here and there ridges called moraines were deposited by the halting ice sheets. These moraines are often discernible as one travels across the country. The soils of the Prairie Plains are known as glacial drift soils and are noted for their fertility and, owing to their great depth, for their endurance. The Prairie Plains constitute one of the wealthiest agricultural regions in the United States.

Fig. 34. — Scene in an Illinois Oat Field

The region is reasonably well drained. Lakes therefore are not numerous. However, there are portions of Indiana and Illinois where the divides between the rivers are wide and low, and where swamps still exist. A good example is found in the rather large area along the Kankakee River in northwestern Indiana. These swamp areas when well drained make the richest of agricultural lands. The rivers which drain the Prairie Plains often have rather shallow valleys, as is seen especially in some of the rivers in Iowa. Some of the larger rivers, like the Illinois and Mississippi, were in existence before the glacial invasion, and at one time were outlets of the Great Lakes. As a result, their valleys are wider and deeper and are characterized by lines of picturesque bluffs.

While agriculture is the leading industry in the Prairie Plains, mining and manufacturing are very important. The output of the great interior coal field in Illinois and Indiana is enormous. The oil industry in this region is also important. Though the flow of oil is waning in Indiana, a new district has been opened up in southeastern Illinois, that is now producing vast quantities of oil. Refineries are often established at the towns and cities near the oil wells. Lawrenceville, Illinois, engages largely in the refining industry.

Because agriculture is so important and coal so near at hand, many thriving towns in the Prairie Plains engage in the manufacture of farm implements, wagons, carriages, and tools of all kinds. Indianapolis, for example, has become the metropolis of Indiana. It is in the center of a rich agricultural region, and its growth has been stimulated by the demand for a convenient market. Historically, its location was determined by the intersection of the White River and the National Road. This road still forms the central street of the city and can be traced eastward through Columbus (Ohio), Wheeling (West Virginia), to Richmond (Virginia).

In such a rich and productive country as the Prairie Plains, the need of transportation lines would, of course, be great. In the early days the navigable streams furnished the main commercial thoroughfares. The levelness of much of the country, however, made the construction of railroads relatively easy, and now the country is a network of steel. As a result, river commerce has declined.

EXERCISE 1: Glaciation in North America

FIG. 35. — SKETCH-MAP SHOWING AREA IN NORTH AMERICA COVERED BY ICE AT THE MAXIMUM STAGE OF GLACIATION
(United States Geological Survey)

1. On an outline map show by dotted line the southern limit of the Great Glacier.

2. What relation does this line seem to bear to the Missouri River? To the Ohio River?

3. What states along the Missouri were partially glaciated?

4. What states along the Ohio were partially glaciated?

5. Look at good maps of New England; New York; Michigan; Wisconsin; and Minnesota. Were all of these areas glaciated? Are lakes numerous in all?

6. Look at a good map of southern Pennsylvania; of southeastern Ohio; of Kentucky; of Kansas. Were these areas glaciated? Are lakes numerous? What, then, do you conclude relative to the origin of many lakes?

7. Write one sentence about glaciation in Canada. Why was this country all glaciated?

8. Why was southern United States not glaciated?

EXERCISE 2: The Extent and Character of the *Prairie Plains*

1. Look in the dictionary to find the exact meaning of the word *prairie*.

2. What, then, is the meaning of *Prairie Plains?*

3. Examine a regional map to learn the extent of this region. (Illinois, Indiana, and Iowa lie almost wholly within the Prairie Plains; included also are

the west half of Ohio, the south half of Wisconsin, nearly all of Minnesota, and the east third of the Dakotas and Nebraska. A small portion of Kansas, and the north third of Missouri also belong to this region.) On an outline map of the United States, draw a light line around the Prairie Plains.

4. Review with care the material in your textbook to learn of the surface and soils of this region. Write a paragraph describing the surface. Make a clear statement relative to the origin and quality of the soils. The material in this chapter will help you answer these questions.

EXERCISE 3: A Study of the Upper Mississippi River

1. Select a good map showing Minnesota and Wisconsin. Make an outline sketch of these two states. Draw the Mississippi, St. Croix, and Wisconsin rivers.

Photo by W. H. Norton.

FIG. 36. — THE MISSISSIPPI AT LANSING, IA.
Looking up the river from the Illinois shore

2. Describe the source of the St. Croix with reference to Lake Superior. Were this lake somewhat enlarged, what might become its outlet?

3. A great glacier once dammed the St. Lawrence River. How did this affect the volume of water in the Great Lakes? Comment on the volume of water in the St. Croix and Mississippi rivers, which, at that time, carried the overflow of Lake Superior.

4. Study Fig. 36 and answer the following questions:

a. Does the river fill its valley?

b. Do you think the present river carved the valley as you see it, leaving the lofty bluffs?

c. When do you think the wide and deep valley was made?

d. Study the picture and write a short paragraph describing the scenery along the Upper Mississippi.

5. Write a short, well-connected, and complete account of the Upper Mississippi as outlined in this exercise.

EXERCISE 4: Soils of the Prairie Plains

Fig. 37.—Tiling Level Lands, Illinois

1. Examine Fig. 34 carefully. Do you think the harvest on this farm is bountiful? The farm is in Illinois. What is the crop?

2. Judging from the crop and surface, do you think the soil is rich? What is its origin? (See material in this chapter.) How is glacial soil made? Use the index in your textbook and look up references concerning glacial soils. Record one reason why they are good.

3. Glacial plains are often very level. Examine the picture at the left. What is being done? For what purposes? Describe the process.

4. Look at the landscape in Fig. 37. Do you think farmers can always depend upon natural drainage? Why?

5. What do you conclude as to the amount of rainfall on this farm? Find the annual precipitation of the Prairie Plains by reference to a rainfall map. Record in inches.

6. After observing the picture, give one reason why glacial drift soils are easy to cultivate.

7. What two great rivers, in a general way, mark the boundaries of glaciation in the Mississippi Valley? Name eight states whose soils are composed of glacial drift. Are these states of leading agricultural importance? What, then, is your conclusion relative to the fertility of glacial soils?

PROBLEM 1: What Body of Water furnishes the Moisture for the Prairie Plains?

1. Examine a rainfall map to learn the annual precipitation in the Prairie Plains.

2. The prevailing winds blow over this region in what direction?

3. What mountains do these winds cross? How does the crossing of high mountains affect the moisture in the winds? Why is the Pacific Ocean, then, of slight value to the Prairie Plains as a source of water supply?

4. Could winds from the Arctic Ocean bring moisture to the Prairie Plains? What would be the temperature of such winds when they start? Could they carry much moisture? How would the temperature change as the winds reached lower latitudes? Would such conditions favor precipitation? Could you expect north winds, then, to bring much rain to the Prairie Plains?

5. Should winds blow from the Atlantic, could they carry their moisture into the Prairie Plains? Why? What mountains would these winds cross?

6. "Cyclonic lows" in the Mississippi Valley often cause the winds to shift and spiral in from all directions. East winds in the Prairie Plains, then, really start in the south. Over what body of water do they start? What of their temperature? Are the conditions right for these winds to carry much moisture? How would the temperature change as these winds advance northward? What would result? What body of water, then, will furnish moisture for the Prairie Plains?

EXERCISE 5: Agriculture in the Prairie Plains

1. Review your textbook to determine the three leading agricultural products of this region. Record them in order of importance.

2. In what states is corn the leading crop? Where is wheat raised extensively?

3. Name three conditions that determine the profitableness of agriculture in a region.

a. Consult a rainfall map to find the annual precipitation in Illinois; in the Dakotas. (Longmans' *New School Atlas* is a good reference book.)

b. Find statements in your geography concerning the temperature of Iowa and Illinois. Are the summers hot? The winters cold? Answer the same questions for Minnesota and North Dakota.

c. Look for pictures of farm life in any part of the Prairie Plains. Why do you think the farm lands are easy to cultivate?

4. Write a short paragraph stating why agriculture is the leading industry in the Prairie Plains.

5. Consult Fig. 38 and list the five leading corn-producing states in order of importance. Consult Fig. 38 and, in like manner, list the five wheat-producing states.

THE PRODUCTION OF CORN IN THE UNITED STATES

The United States holds the position of supremacy in the production of corn for the reason that its soil and climate are peculiarly suited to corn culture. River alluvium, glacial deposits, and newly cleared forest

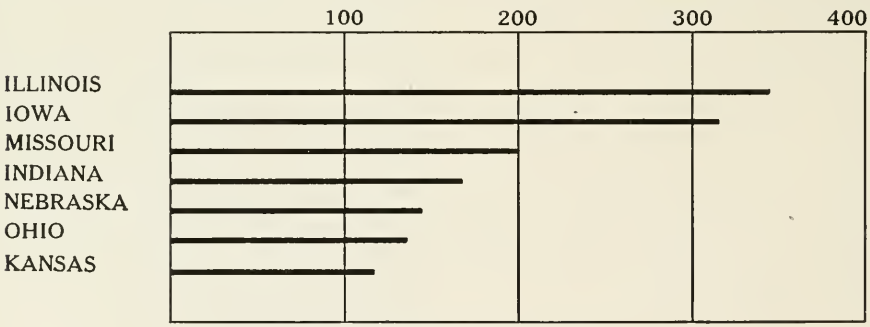

FIG. 38. — CORN OUTPUT, 1910
(In million bushels)

lands, rich in vegetable mold, are the most desirable lands for this crop. Rain should not come too frequently, but when it does come should be copious. The soil should not be so heavy as to become stiff and compact after a rain. The middle portion of the summer should be hot both day and night, and there should be an abundance of sunshine. As corn

requires a longer warm season than wheat, the " corn belt " lies south of the wheat belt.

Should we visit a large farm within the corn belt, we might observe that none of the work connected with the growing of corn is done by hand ;

Fig. 39*a*. — Corn growing in Fertilized Illinois Field

on the contrary, the farm is equipped with corn planters, corn cultivators, corn cutters, corn huskers, and corn shellers. The development of the corn industry has therefore led to the establishment of enormous plants for manufacturing this machinery. Many thriving cities like Rockford and Moline, Illinois, Canton, Ohio, and South Bend and Indianapolis, Indiana, are engaged in the manufacture of farm implements.

Within the corn belt the State Universities have shown a marked interest in the proper methods of corn culture. By careful and reliable experiments the agricultural departments of these schools have shown that, by using the proper kinds of seed, by well selected fertilizers, and

by scientific methods of cultivation, the corn output of the United States can be doubled without increasing the acreage devoted to corn. At present the average yield throughout the United States is 30 bushels per acre, though within the corn belt it is much larger. It is in the South

Fig. 39*b*. — Corn growing in Unfertilized Illinois Field

that the yield is particularly small, though this is the region where the yield should be surest, as the soil is good and the season is not shortened by early frosts.

SOME USES OF INDIAN CORN[1]

Corn is rapidly taking the place of wheat in Wisconsin, Minnesota, and even in parts of Canada. In western Canada corn has been raised as far north as the fifty-sixth parallel. This northern expansion is due to the development of a variety that matures quickly.

[1] The Corn Products Company of Chicago supply a very interesting exhibit of commercial products made of corn.

Corn is the most nutritious and most easily digested of all the cereals, including wheat. Were it not for the fact that the germ contains an oil that is to many people disagreeable, corn would be used more extensively as a human food. Even in spite of this handicap more people eat it than we would at first think. Corn is the principal food of the people of Italy. From the coarsely ground grains they prepare a porridge called "polenta" that the poorer classes eat, while the well-to-do prefer a finely ground meal. The natives of South Africa grow corn extensively, and their most important food is a corn porridge known as "mealies." The Mexican is also very fond of corn and uses it as his principal food.

In our own country corn has ever been an important food of the frontier. Though rich in both nitrogenous matter and fat, it does not make good bread unless mixed with rye or wheat flour. Much of the bread used in early colonial days was made in this way. At present it is only in the South that corn is used extensively as a human food.

Corn is, however, one of the most widely used grains in the world as a food for all kinds of farm stock. For this reason it does not form an important part of the world's commerce; in fact three-fourths of the corn produced within the corn belt is never removed from the farms that produce it, but is fed to the stock, especially the hogs, that are raised in large numbers.

Thousands of bushels of corn are used yearly in the manufacture of whisky. This being true, it is only natural that Illinois, situated in the heart of the corn belt, should lead the states in this industry. The city ranking first among American cities is Peoria, Illinois, whose output of distilled liquors in 1905 was valued at $42,000,000, which is three-fourths of the combined output of the United States.

Large quantities of corn are used in making sugar. A treatment of hot dilute sulphuric acid changes starch into sugar. This form of sugar is known as grape sugar, and is not so sweet as cane or beet sugar. Since corn is rich in starch, it is only natural that it should be used in making grape sugar. This sugar is used extensively in brewing, and in the manufacture of cheap candies. The sirup of grape sugar is called glucose. When mixed with molasses it forms the thick, light sirup that we relish

on our breakfast cakes. A bushel of corn makes from 30 to 40 pounds of glucose.

To manufacture corn oil the germs are first extracted, then the oil is pressed out by machinery. This oil is used exclusively as a substitute for linseed oil in mixing paints. It is also used as a salad oil, for illuminating purposes, and as a lubricant. When vulcanized it forms an adulterant and substitute for rubber.

The most important use of corn stalks is for coarse fodder for stock. They are, however, used in the manufacture of coarse paper. The pith from corn stalks is packed between the double hulls of warships for the reason that when dampened it expands, thus closing a hole made by a cannon ball.

Indian corn is a most important food for man and domestic animals. It has become, also, a very important commodity in the industrial arts.

EXERCISE 6: The Study of Indian Corn

I

1. Determine the area included in the "Corn Belt."
2. On your outline map showing the Prairie Plains, draw a dotted line around the corn belt.
3. Corn forms the most important food for man and animals.
   a. Name three articles of food for man that are made of corn.
   b. From what animals does our meat supply largely come? On what food are these animals fattened?
4. Locate Peoria, Illinois, on your map.
   a. Is it in the corn belt? What part?
   b. Give a reason why this city should be the largest distilling center in the world.
5. Name the states which lead in corn production. Write your answer, giving the states in order of importance.
6. Which requires more moisture, corn or wheat? Which requires a higher temperature? Explain why the Dakotas raise wheat instead of corn.

II

7. Write a sentence to show why Iowa and Illinois are well adapted to the production of corn.

8. Read in a geographical reader to learn how corn is cultivated. Relate the account to your teacher.

9. Is stock raising an important industry in the corn belt? Why?

10. What city is the great market for grain and live stock? Locate it on your map.

11. Illinois and Iowa raise almost equal quantities of corn and live stock.

a. Which state will market more corn? Why?

b. Which state will market more live stock? Why?

12. Make a graph showing how the production of corn in United States ranks with wheat.

EXERCISE 7: The Value of Crop Rotation and Fertilizers in Maintaining the Productive Capacity of the Soil

1. Study Fig. 39 *b* carefully. What does "No R." in the legend mean? What does the word "None" mean? What crop was grown in this field last year?

2. The field shown in Fig. 39 *a* was planted at the same time. Explain the terms in the legend: "3 Yr. R.," "Legm.," "Lime," "Phos."

3. About how tall is the man in the pictures? Estimate the height of the corn in Fig. 39 *a*; in Fig. 39 *b*. Why the difference? How tall do you think the corn in Fig. 39 *a* will be when it "tassels" and reaches its full height?

4. These are *experiment* fields of the University of Illinois at Urbana. Do you think the soils in Fig. 39 *b* can be made to produce as fine corn as the soils in Fig. 39 *a*? How?

5. Can soils be "worn out"? Can "worn out" soils be revived and replenished? How?

6. What service can agricultural schools and colleges render the farmers of the country?

NOTE. — Soils often lack *nitrogen*, *phosphorus*, or *potassium*. Nitrogen is a gas. Leguminous plants, through bacteria in the nodules of their roots, accomplish the "fixation" of free nitrogen of the air in the soils. Phosphorus is contained in phosphate rock. Soils formed of decayed limestone and phosphate rocks are usually fertile. Rock flour is often used on soils. Potassium is usually abundant in soils. Kainit containing

"potash" is a commercial fertilizer. Nitrogen is necessary to rapid growth of stalks and stems. Phosphorus hastens the deposit of starch in plants and helps mature crops. Potassium strengthens growing stalks, increases the deposit of starch, makes the crop. Lime sweetens sour or acid soils.

EXERCISE 8: Commercial and Industrial Centers of the Prairie Plains

1. Sketch in a group Ohio, Indiana, Illinois, Iowa, Missouri, Kansas, and Nebraska.

2. Draw the more important rivers that drain these states. (Learn to print names attractively.)

3. Indicate the positions of the following cities: St. Louis, Indianapolis, Peoria, Cleveland, Cincinnati, Kansas City, and Omaha.

4. Review material in your textbook and select a pertinent statement concerning each city. Tabulate your answers. Illustration:

    1. Peoria is the greatest distilling city in the United States.
    2. Etc.

Try in each case to discover why the industry is so localized.

EXERCISE 9: The Importance of Chicago

1. Look at a railroad map of the United States. Count the *trunk* lines that enter Chicago.

2. Describe the water route from Chicago to the ocean, naming every body of water through which boats would pass. Where are canals necessary? Why?

3. The American Steel Works and the Pullman Car Company are located in Chicago. Select the cheapest route by which iron ore can be brought to this city from the Mesaba Range.

4. Think of a good reason why Chicago has an advantage over St. Louis as a grain market. Consult your textbook to learn the importance of Chicago in this respect.

5. Is there a picture of the Chicago Union Stock Yards in your textbook? Write two statements suggested by the picture. From what general direction does live stock come to Chicago? Why? The packed meat is shipped in what general direction? Why?

6. How does the position of Chicago make it an important center for the lumber trade? How does lumber reach Chicago? Name three lumber states that supply the city. What region near Chicago is relatively without a forest supply? Select three cities of some importance in this region that secure their

lumber supply from Chicago. Why would none of these cities be on the Mississippi River?

7. Review your textbook material relating to Chicago.

8. Name two conditions that have aided in Chicago's growth.

PROBLEM 2: Why has St. Louis developed into so Important a City?

I

1. Make a small sketch of that portion of the Mississippi River from Quincy, Illinois, to Memphis, Tennessee. On your map show also the lower course of the Illinois River to Peoria; the lower course of the Missouri River to Sioux City; and the lower course of the Ohio River to Cincinnati.

2. Locate St. Louis, Kansas City, and Omaha.

3. Consult Fig. 41 and note the head of navigation of the Missouri River. Recall the leading cereal crop in the territory drained by the Missouri River and make a clear statement concerning the commerce of the river before railroads were so numerous.

4. Note the head of the navigation on the Mississippi River; the Illinois River. Why is it an advantage to a city to be located near the meeting places of navigable rivers? Why do you think flour milling would develop in a city so situated? Read your textbook to learn if milling is an important industry in St. Louis.

5. Remembering the importance of cattle raising in the Great Plains, name the important industries that as a result you would expect to find in Omaha, Kansas City, and St. Louis. Verify from your textbook. Why, then, is the boot and shoe industry so important in St. Louis?

II

6. What mountains are near St. Louis? From your textbook learn the minerals that are mined in these mountains. Why *might* these minerals be brought to St. Louis for shipment?

7. Consult a railroad map of the United States and select the three cities most closely connected with St. Louis. Why do you think St. Louis is such an important railroad center?

8. Glean three statements from your textbook regarding the general productiveness of Missouri and Illinois. Why is it an advantage to a city to be in the center of a highly productive area?

9. The three centers of the brewing industry in the United States are Milwaukee, Cincinnati, and St. Louis. Why do you think St. Louis is in this group?

10. Write a short paragraph, summing up the reasons why St. Louis has developed into so important a city.

EXERCISE 10: Average Value of Land per Acre

1. From Fig. 40 determine the average value of farm lands in the Prairie Plain region. Why is land most valuable in Illinois?

2. How do farm lands of the Pacific Slope region compare in value with those of the Prairie Plains? Why the difference?

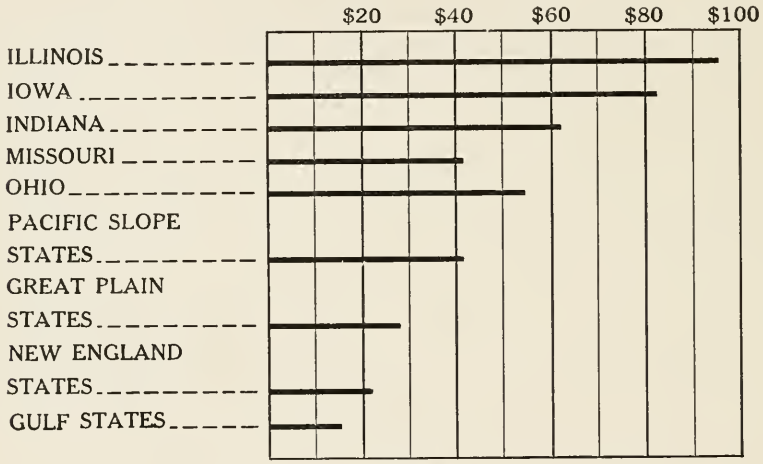

Fig. 40. — Average Value of Farm Land per Acre (1910)

3. Name the states included in the Great Plains region. Why is land less valuable here than in the Prairie Plains? If in doubt, consult a rainfall map of the United States.

4. Has New England abundant rainfall? Is this region near good markets for farm products? Why, then, is land so cheap? Give two reasons.

5. How does lack of good drainage affect the value of farm land? In what part of the United States are swamps most abundant? What is the value of farm land in this region? Name the region.

6. Write a paragraph in which you give three reasons why farm lands are more valuable in the Prairie Plains than elsewhere in the United States.

EXERCISE 11: Extent of Navigable Waters in the United States

1. Consult Fig. 41. Name the navigable rivers that flow into the Atlantic Ocean. Account for the fact that all except the Hudson are navigable for about the same distance.

2. Locate the city at the head of navigation on the Hudson River. Trace the water route from Albany to Lake Erie. Name this route.

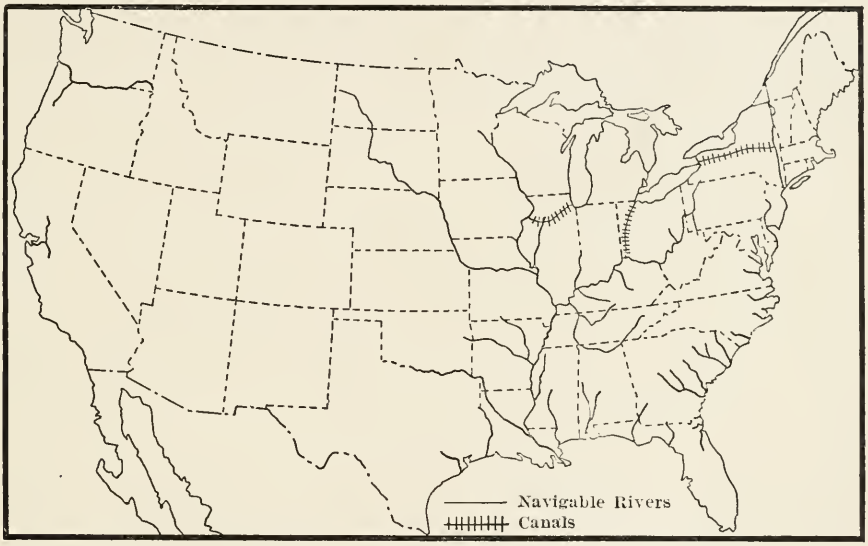

FIG. 41. — EXTENT OF NAVIGABLE WATERS IN UNITED STATES

3. Indicate the position of Pittsburg. Name the rivers that unite at Pittsburg. Are they navigable?

4. Name a large city on the Mississippi River that is located at the meeting point of three navigable rivers. Name these rivers. By what water route is the Mississippi River connected with the Great Lakes? Trace this route.

5. Tabulate the states that have no navigable waters. Account for the absence of navigable streams in these states.

6. Name a large river on the Pacific Coast that is not navigable. Name two that are navigable. On which is navigation most extensive?

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CHAPTER VII

THE OZARK REGION

THE OZARK UPLIFT

By the Ozark Uplift, or Plateau, is meant a mountainous and island-like region lying largely in Missouri. It is surrounded on all sides by a broad expanse of prairies. The plateau includes southern Missouri, northern Arkansas, and the eastern edge of Oklahoma, occupying an area of 75,000 square miles. It is 500 miles long and has an average width of 150 miles. In elevation it varies greatly. The mountains, once much higher, are now greatly worn. The highest peaks and ridges rise from 1800 to 2100 feet above the sea and from 1400 to 1800 feet above the surrounding plains.

The surface of this region is very similar to that of the Alleghany Plateau, though on the whole it is less dissected. North of the Arkansas River the rock layers are nearly horizontal, the irregularities in surface being due to stream sculpturing. The harder, more resistant rocks stand up as ridges, while the softer rocks have been worn away, forming valleys. South of the Arkansas River the rocks have been folded, giving this region a more rugged appearance. Here and there domelike masses of crystalline rocks rise through the strata. Iron Mountain and Pilot Knob are examples of such masses.

The soil of the Ozark Plateau is fertile, and the rainfall is sufficient for agriculture. Throughout the entire region a great variety of natural trees grow in abundance, in marked contrast with the treeless prairies on every side. Few of these forests have been removed, and the country is but sparsely settled.

The region is noted for its beautiful scenery and health-giving springs. In Missouri there are rich deposits of lead and zinc that are mined, especially in the Joplin district.

EXERCISE 1: Surface, Soil, and Industries of the Ozark Uplift

1. Sketch in a group the following states: Missouri, Arkansas, Kansas, Oklahoma.

2. Indicate the position of the following: Little Rock, Cairo, Jefferson City, Muskogee. Connect these cities with a circular line. Label the area circumscribed *The Ozark Uplift.*

3. Study your map carefully to see why the region is so named. Record your answer.

4. Consult the material in this chapter, also your textbook, and answer the following:

a. How long is the Ozark Uplift? How wide? What is its area in square miles? How does it compare in extent with your own state?

b. How high is the Ozark region above the sea? Above the surrounding plains? How does its elevation compare with that of your home region? (Consult a relief map and a model in answering these questions.)

c. The surface of this uplift resembles that of what region you have studied? Describe the soils. Is the rainfall sufficient for agriculture?

d. Why is so much of this region forested while the surrounding plains are not? Fruit growing is developing rapidly. How can you account for this?

e. What advantages have mountains as summer resorts? Indicate the position of several large cities so near that the people would be likely to go to the Ozarks for their summer's outing.

f. Consult your textbook to learn what minerals are found in Kansas; in Missouri. What metal is mined in the "Joplin District"?

THE MINING OF LEAD AND ZINC

There are two areas in the United States that produce lead and zinc extensively. The first region, known as the Wisconsin field, is 65 miles long by 55 miles wide, and embraces 2600 square miles. Five-sixths of this field is in Wisconsin and one-sixth covers the contiguous corners of Illinois and Iowa. The second field includes the southwest corner of Missouri and extends into Kansas and Oklahoma.

Though both of these fields have produced extensively, the latter field is the richer. For the past fifteen years the value of their combined output of lead and zinc has varied annually from $1,000,000 to $5,000,000.

In the Wisconsin field the mines are about 100 feet deep. Usually the ore is found in pockets in the Galena limestone. Just how this ore was collected is very interesting. Many, many years ago, there were great beds of shale [1] lying *just above* the limestone in which the ore is now found. Gradually, through a long period of time, these beds of shale were worn away by streams and weather. Scattered through this shale were small particles of lead and zinc; and, since these were heavier than the rock, they were left behind or, in other words, were not carried away by the streams.

FIG. 42. — MINERAL DEPOSITS IN KANSAS

Later, these minerals were dissolved by surface waters which, in turn, settled into the cracks and pockets of the Galena limestone. Here, by chemical processes hard to explain, the metals were caused to collect in the rock crevices, forming great veins of valuable ore.

The digging out and bringing to the surface of these metals is called *mining*. After the ore is mined, it is crushed in order that the rock fragments may be taken out; this process is called *milling* the ore. In order that all the impurities may be removed, the milled ore is then placed in great smelters and melted. In this manner the heavy melted

[1] See Dictionary.

ores can be drawn away from the lighter rock materials which remained with them during the milling. This last process is called *smelting*.

The cities of La Salle and Peru, Illinois, and Pittsburg, Kansas, are engaged largely in the smelting of zinc ore. The two Illinois cities are engaged in this industry because they are surrounded by mines of bituminous coal and because they are located midway between the rich zinc mines of the Joplin district and the great commercial city of Chicago, which serves as a distributing point for manufactured zinc products. Pittsburg engages in the industry because it is located in the midst of the zinc, coal, and gas fields of Missouri, Kansas, and Oklahoma.

THE APPLE INDUSTRY

The apple is the most widely used fruit in the United States. So extensive is its consumption that in 1900 we produced nearly 200,000,000 bushels. Since the apple tree thrives in a wider variety of climates than most fruits, it is grown in many sections of the United States. Though grown extensively, it is in the Ozark Region that the apple industry is expanding most rapidly. Since 1900 Missouri has been able to boast of a greater number of apple trees than any other state. Not only are the Ozarks in Missouri important, but the orchards extend also into Arkansas. The fact that in 1907, when most of the orchards of the country suffered from frosts, a single county in the Ozarks of Arkansas was able to produce $2,000,000 worth of apples, shows the importance of these orchards. The expansion of the apple industry in the Ozark Plateau is due to several causes. The land is cheap because it is too rough for the growth of cereals. Though the land is rough, apple trees thrive upon the slopes, because the soil is rich and the rainfall abundant. The fact that the prairies on all sides of the Ozarks do not grow apples extensively insures a ready market for the crop. This region bids fair to become an important fruit center, for it is well suited to the production of nearly all kinds of fruits.

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CHAPTER VIII

THE GREAT PLAINS

GENERAL CHARACTER OF THE GREAT PLAINS

The Great Plains region is a wide belt of elevated country lying between the Rocky Mountains and the Prairie Plains. This great region is a gently eastward-sloping plateau. The Great Plains, extending from Canada into Mexico, include the following subdivisions in order from north to south: (*a*) Missouri District, (*b*) Platte Plateaus, (*c*) Arkansas Plateaus, and (*d*) Llano Estacado.

By political divisions the plains, or more properly speaking the *plateaus*, include the second tier of states west of the Mississippi River and south to Texas, and about one-third of the eastern part of the states forming the third tier. Only the northwest half of Texas is in this region.

The western border of the Great Plains constitutes the foothills of the Rocky Mountains. The slope eastward is very gentle, the plains finally merging into the Lake and Prairie Plains. The altitude of the higher western portion reaches four to six thousand feet, while at the eastern border it drops to about one thousand feet.

The drainage is generally eastward, many large rivers rising in the Rockies, and traversing the entire width of the plains. The drainage nearly all reaches the Mississippi River. The Great Plains are, of course, well drained, as shown by the absence of lakes. The rivers often decrease in size as they journey eastward, for the dry, sandy soils drink in the water readily, and evaporation is rapid under bright suns and in dry atmospheres. The Platte River offers a fine illustration of a river suffering from these conditions. One interesting fact relative to the rock strata of the Great Plains, is that they dip westward while the drainage is eastward. The water flows across the strata, not as it flows from a shingled roof, but in the opposite direction.

When this part of the ancient sea bed was raised, the east side was first uplifted, the process gradually extending to the west. As a result many valleys and depressions of the Great Plains became inclosed lakes, whose waters gradually became salt. The beds of gypsum and salt in Kansas are thus accounted for. Kansas is the fourth state in the production of salt.

The Great Plains are characterized as subhumid along the 100th meridian, and as semiarid farther west. The soils are generally fertile, and a scanty rainfall is the only check to their productiveness. The precipitation decreases from 30 inches in the east, to 20 inches at the 100th meridian, and to 10 inches at the western border.

The Black Hills are formed by a dome-shaped uplift in the earth's crust. The dark appearance of the forested slopes gave rise to the name "Black Hills." This region is rich in mineral wealth. These mountains show well how elevated lands can intercept moisture. Considerable rain falls on the west side.

South of the Black Hills, overlapping the boundaries of South Dakota and Wyoming, are the Bad Lands. This region is very rough, hilly, and almost mountainous, owing to the high degree of erosion that has taken place. The country is practically worthless. The rainfall is so meager that turf never forms, hence erosion is unobstructed.

The Llano Estacado is in northern Texas. The region is arid. Shifting sands obliterated the trails of the pioneers, and hence stakes were driven across the plains for guides. This is the origin of the name Llano Estacado, meaning *staked plains.*

The soils of the Great Plains are the chief source of wealth. Corn in the east, wheat in the central belt, and stock raising in the west, show well how industries adapt themselves to moisture conditions. Great railroads have little difficulty in extending their courses westward across the level plains.

A broad belt of country lying just east of the Rockies, and extending two degrees east and four degrees west of the 100th meridian, constitutes the "High Plains," a term here used to signify the western portion of the Great Plains. The altitude varies from 2500 to 4000 feet. The surface of the region is generally level and monotonous, except in northeastern

Nebraska, South Dakota, and Wyoming, where the streams have so completely dissected the country, that travel across it is almost impossible. This is the " Bad Lands " region already described.

Usually the High Plains receive enough moisture to permit a light turf of native grasses. In Kansas and Nebraska, especially, the plains are covered with fine carpets of buffalo and grama grasses. Grazing is the principal use to which these lands are put. Small areas, where the soil is of fine texture and deep, retain sufficient moisture to produce crops. In Nebraska the alluvial bottom lands along the Platte are irrigated and are farmed with satisfactory results.

The High Plains receive only from 10 to 14 inches of rainfall annually, and the region is often referred to as subhumid. " Dry farming " may some day redeem much of this country.

Because of sufficient rainfall for general farming and the general levelness of the land, the eastern part of the Great Plains is much more densely populated than is the more arid and generally rugged western part. The two largest cities of the region, Omaha and Kansas City, are located near the eastern border.

PROBLEM 1: Why are Salt and Gypsum Deposits found in Central Kansas?

1. Re-read the preceding material on the Great Plains. What part of Kansas was first lifted from the Great Interior Sea?
2. Explain how the uplift of the surface of Kansas from the east formed inclosed lakes. Was the water in these lakes salt or fresh? Why?
3. How can salt in strong brine be recovered?
4. What is the annual rainfall in central Kansas? Are dry winds common?
5. Why are there no lakes in Kansas now? What became of the salt when the waters disappeared?
6. Show why, if the *uplift* had begun in the west, there would have been *no* salt deposits in Kansas.
7. How does Kansas rank in the production of salt? What city in the state is named for the salt? Locate it.
8. What is the annual rainfall at Salt Lake City? Explain why Great Salt Lake is becoming salter each year.
9. State concisely why there are salt and gypsum deposits in Kansas.

THE NATURE OF A CYCLONE — CAUSES OF CYCLONES

We are likely to think of cyclones as violent storms that destroy property and life. Storms of this kind are properly called tornadoes. Cyclones are very rarely destructive; in fact, they are often so mild that delicate instruments are necessary to detect their presence.

As shown on a weather map, a cyclone is an area of low pressure surrounded by high pressure, with the air flowing into the low-pressure area from all sides.

This air movement may be explained as follows: Warm, moist air is light, as is shown by the rising columns of air over a heated stove, or over a hot-air register. Whenever an area of warm, rising air develops on the earth's surface, it is called a *low* for the reason that this air is so light that it permits the mercury in a barometer to fall to a lower level.

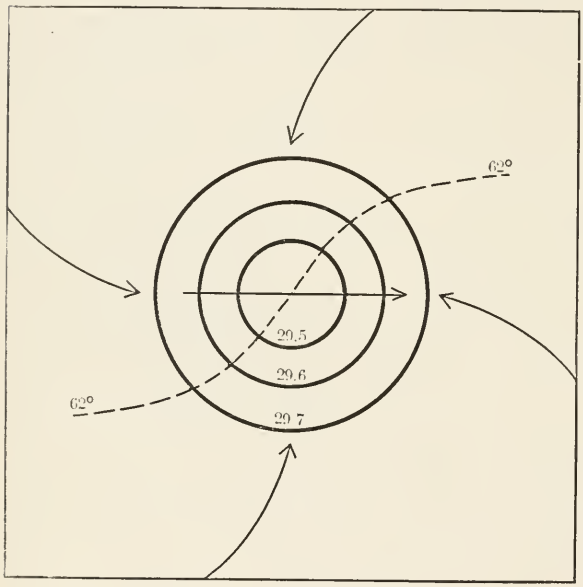

FIG. 43. — A CYCLONIC LOW

Since the winds always blow from areas of heavy air or high pressure to regions of light air or low pressure, there will be an inward movement of air from all sides toward this central low-pressure area. Often these winds blow for long distances, even hundreds of miles, to enter the central low.

Warm air is able to hold much more water vapor than cold air. As the winds that blow into the central low-pressure area from the southeast are generally warm, their capacity for holding moisture is great; hence these winds will gather much moisture and bring it toward the low.

The movement of air in a low is upward, due to its expansion and whirling motion. As the air rises it cools, condensation takes place, and rain or snow falls. A low is called a " storm center " for this reason. No sooner does a low develop than it is carried eastward by the prevailing westerly winds. All lows that develop in a given place are likely to go in about the same direction, hence the term, " the path of lows."

The Weather Bureau is able to forecast the weather because central stations receive information from substations distributed over the entire United States. These stations readily detect the development of lows, and determine their directions and velocities.

Well-trained men in the weather stations receive warnings of approaching storms by telegraph, and give the information to the people of the locality through the daily papers. Having this valuable information, railroad and lake transportation companies are able to prepare for dangerous emergencies. Farmers, too, regulate their industries in accordance with the approaching weather conditions, thereby often saving perishable crops like hay, grain, and alfalfa.

EXERCISE 1: A Study of Cyclonic Storms

I

1. Cut a two-inch square from transparent paper. Lay the square directly over the word " Low " on a weather map. Trace the word " Low " and the arrows about it that indicate wind directions. Transfer the square to another " Low " and make the two words coincide. Trace in the arrows again. Repeat for four or five lows. What do you conclude as to wind directions near lows?

2. On an outline map of the United States, show by an isobar the location of a low on successive days as it crosses the continent. Make a heavy dotted line to show the storm track. Measure, by means of the scale, the distance traveled every twenty-four hours. Average a dozen measurements to secure the approximate daily velocity of cyclones.

II

3. Trace several isotherms through lows found in the Mississippi basin. Note the bends which the isotherms make. In what direction do they bend in

front of the low? In the rear? (See Fig. 44.) Remembering what has been said about wind directions, account for these bends. Why are our west winds cool in summer and cold in winter?

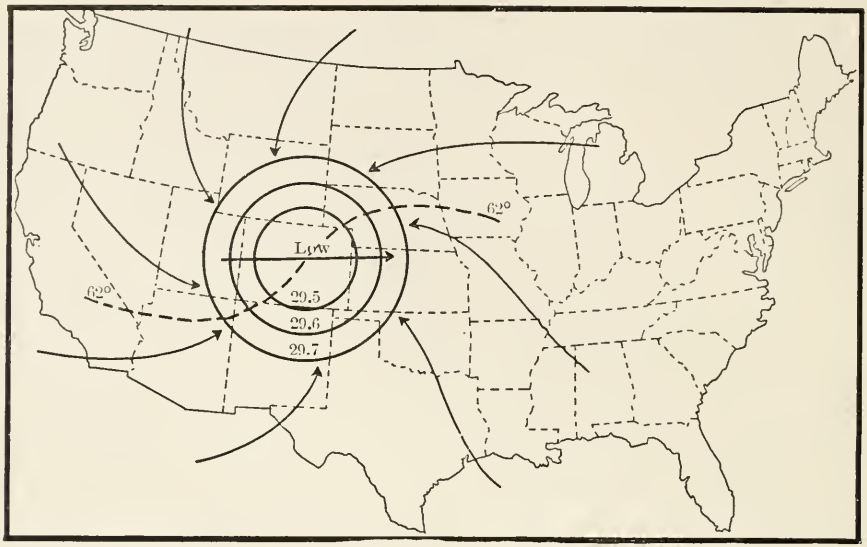

Fig. 44. — A Weather Map

4. Observe the cloud and rain areas as lows cross the country. In which direction from the cyclonic center is the largest cloud and rain area? Which wind brings the most moisture? Why? From what source does most of our moisture come?

III

1. Observe carefully a cyclonic low as it passes over your locality. Make observations daily.

2. Record the direction of the wind as the storm approaches; as it leaves.

3. Record the temperature as the storm approaches; as it leaves. Compare.

4. If possible, *read* the barometer for several days. Compare the *pressure* as the storm approaches with the pressure as it leaves.

5. Try to determine whether rain falls during a high or a low barometer. Write your conclusion.

PROBLEM 2: How do "Cyclonic Lows" help in bringing Moisture to the Great Plains?

1. Study Fig. 44, showing how the winds *spiral in* toward the low-pressure area. Learn from the description of cyclonic storms in this chapter, the statements relative to the sources of winds.

2. If there is a well-defined storm center, or *low*, over Denver, in what direction will the winds be blowing at New Orleans? Why will this wind have a rather high temperature? Why will it be moisture-laden? Answer in complete sentences.

3. Study the Daily Weather Map and note directions of incoming winds. Note also movement of the "low" and whether precipitation is greater on the east, or front, or on the west, or rear, of it.

4. While a portion of the atmosphere is moving north and west to meet the low, in what direction will the low itself be moving? (Teacher suggest if necessary.) Since the low travels eastward at about the same rate as the winds spiral westward, they will meet near the 100th meridian. Do you think moisture-laden air from New Orleans will be drawn by *lows* farther west than Topeka and Lincoln? Why, then, will east winds (starting in the south) bring more moisture to the east portion of the Great Plains than to the west?

5. What part do cyclones play in bringing rain to the Great Plains?

PROBLEM 3: Why is the Rainfall so Meager on the Great Plains, west of the 100th Meridian?

1. Consult a rainfall map and refresh your memory relative to the precipitation in this region.

2. In what direction do the prevailing winds cross the Great Plains?

3. Where would these winds pick up moisture?

4. Over what mountain ranges do they pass before reaching the Great Plains? Name the mountain systems, giving the approximate height of each.

5. Why do mountains intercept moisture from passing winds? Which slopes of the Sierra Nevada and Cascade Mountains receive more rainfall? Which slopes are more densely forested? Verify by reference to your textbook.

6. When the prevailing westerlies slide down the east slopes of the Rocky Mountains into the Great Plains, how will their temperature be affected? Will this change favor or hinder precipitation? Why?

7. Comment on the value of the Pacific Ocean as a source of moisture supply

to the Great Plains. What water body furnishes most of the moisture for this region?

8. Summarize by writing a short paragraph, giving one good reason why the Great Plains are subarid or subhumid.

EXERCISE 2: Rainfall and Progress in the Dakotas

1. Make a neat sketch of these two states.

2. What is the approximate area of North Dakota? Compare with the three states south.

3. Locate the capital of each state. Learn to spell the names. Sketch the Missouri, James, Cheyenne, and Belle Fourche rivers. Do rivers rise in western North Dakota? Look sharply at your map to answer this question. What does this suggest about rainfall?

4. Do rivers rise in western South Dakota? Sketch the Black Hills on your map and show exactly where rivers rise. Why on the *west* side of the mountains?

5. Again examine your map. In what part of North Dakota are towns and cities numerous? Of South Dakota? What parts of the states are best settled?

6. In general what amount of rain falls east of the 100th meridian?

7. Look west of this meridian for towns and cities. What is the rainfall west?

8. What is the leading crop in the Dakotas?

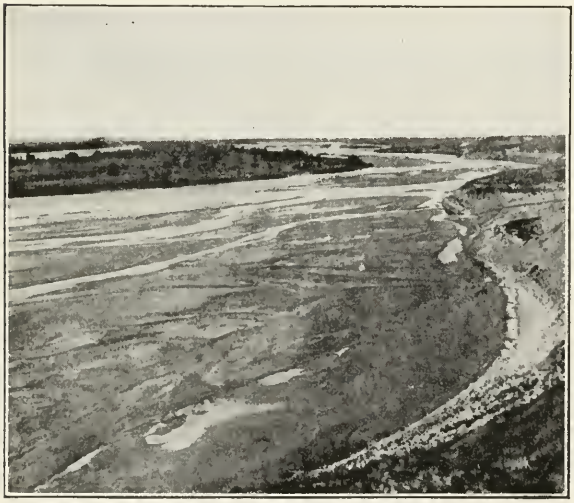

Fig. 45. — The Platte River

9. Write one sentence to show the relationship of rainfall to agricultural development.

EXERCISE 3: The Platte as a Type River of the Great Plains

1. Describe the course pursued by this river. In what *Park* does the North Platte rise? The South Platte? Sketch the river. See Fig. 51.

2. Consult Fig. 45. Compare the width of the river with its apparent depth.

Comment on the height of its banks. Find evidence of its shallowness. Record these answers.

3. Refer to a good map of Nebraska. In what part of the state are streams most numerous? Count the streams in Kansas east of the 100th meridian; west. What is the annual rainfall west of the 100th meridian?[1] How will the volume of water change as the river approaches this meridian?

4. Write a sentence referring to the swiftness of mountain streams. Under what conditions will a stream *carry* much sediment? Under what conditions will sediments settle? Compare the amount of sediment carried by the South Platte at Denver with the amount carried when it enters Nebraska. Explain the presence of numerous *bars* in the Platte.

5. Explain two ways by which the Platte loses water in crossing the Great Plains. What do you conclude concerning the navigability of the Platte?

6. Verify your inference by reference to Fig. 45.

PROBLEM 4: Why does the Eastern Portion of the Great Plains get more Rain than the Western Portion?

1. Re-read "General Character of the Great Plains." Tabulate the precipitation in the east, middle, and west portion of the plains.

2. Would the temperature of the prevailing westerlies be higher on entering the more elevated western portion of the Great Plains or on leaving the Plains at the east? Why? In which belt would rain be more likely to fall? Show that the heavier rainfall could *not* be brought by the prevailing westerlies.

3. If an area of "low pressure" is over the Rocky Mountains, in which direction will the winds cross the Great Plains?

4. If the "low" moves eastward and the moist air moves westward, why will the east portions of the Great Plains be subjected longer to the southeast winds from the Gulf of Mexico? Which portion will receive more moisture?

5. In which portion of the Great Plains is agriculture the leading industry? Why? Grazing? Why?

EXERCISE 4: A Round-up on the Great Plains

1. Write a sentence descriptive of the surface of the country shown in the picture on page 121. Why is it not cultivated?

2. Does the land seem to support a "turf"? Compare with the land used for sheep grazing. Which receives more moisture?

[1] See rainfall map.

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FIG. 46. — A SHEPHERD AND HIS FLOCK, MONTANA

3. What is the purpose of a round-up? What are the intentions of the man in the foreground?

4. Do you think the ranchmen are having a successful season? Do the cattle look thrifty?

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FIG. 47. — A ROUND-UP ON THE WESTERN PLAINS

5. Write a paragraph showing clearly why Kansas City has become a great center for the meat-packing industry.

6. Locate the above scene.

THE WOOL INDUSTRY

Next to cotton, wool is the most extensively used of all the fibers. Indeed, the woolen industry alone is the great rival of the cotton industry. Moreover, the use of wool is increasing rapidly, being more than five

times as great as it was a century ago. The present consumption of wool is so great that for every man, woman, and child in the United States eight pounds are used each year, as against about three pounds only fifty years ago.

The wool of commerce is produced almost exclusively by the domestic sheep; for, with the exception of a very few species in the mountainous districts of Europe, the wild sheep produces hair rather than wool, and even the domestic sheep, when neglected, tends to grow hair. Wool, then, may well be considered a product of civilization.

Kinds of Wool

The finest wool, from pure-bred Merino sheep, is called "clothing" or "carding" wool. Usually the fiber is from two to four inches in length, fine, strong, and crimpy. This wool makes soft, well-fitting garments. It is grown only in semiarid or arid regions; for example, the plateau districts of Australia, Argentina, South Africa, and western United States.

Long, coarse wools are known as "combing" wools, and are used in making yarns and worsted fabrics. The Leicester and Lincoln sheep, found largely in England, Scotland, France, and Canada, excel in its production.

The native or carpet wools are inferior to either of the above, and are produced by sheep that are very nearly in their wild state. These are found in Asia Minor, Russia, China, and parts of Spain.

The Manufacture of Wool

In many respects the manufacture of wool is like that of cotton; but there are differences that require notice. The fleece, fresh from the sheep, must first be "scoured." In scouring, dirt particles of all kinds, together with the "yolk," or grease, are removed. Often this grease is saved and converted into soap. If the wool belongs to the class known as "clothing" wool, it is next carded. In carding, the wool is passed over a cylinder so set with thousands of wire teeth, that it tangles and interlocks the fibers in every conceivable direction. Later this wool is

loosely spun into yarn and woven into woolen goods. Since the wool is loosely twisted, the cloth is soft, and its strength is due to the felting properties of the wool.

In manufacturing the coarse, long " combing " wool, the process is quite different, for it is not carded at all. On the other hand, immediately after it is scoured it is combed. The purpose of combing is to place the separate fibers parallel to each other. They are then tightly twisted

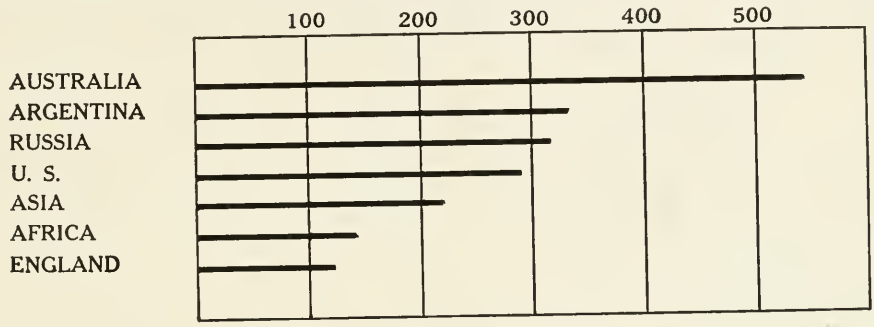

Fig. 48. — World's Wool Clip, 1906
(In million pounds)

and woven. Thus we see that " clothing " wools are scoured, carded, and woven into soft fabrics used mostly in making clothing; while the " combing " wools are scoured, combed, firmly twisted, and woven into the firmer, stronger fabrics.

In 1900 the United States produced 290,000,000 pounds of wool from 60,000,000 sheep, which is three times as much as we produced sixty years ago. Nearly all the sheep raised are either pure or mixed Merinos. The following states lead in the production of wool: Montana, Wyoming, New Mexico, Texas, Colorado, Oregon, Idaho, California, and Utah. The only states east of the Mississippi that raise wool to any extent are Ohio and Michigan.

All the wool that we raise is manufactured in our own mills, and we import more than 100,000,000 pounds yearly. The wool imported comes chiefly from Australia, Argentina, Uruguay, and South Africa. This wool, which is of the cheaper, coarser grades, is made into carpets.

Boston is the most important American market for wool, being a

convenient center for the distribution of wool to the manufacturing towns of New England; for New England still operates more than one-half of all the woolen mills in the United States, while Pennsylvania, New York, and New Jersey operate a third.

We must go outside of New England, however, to Philadelphia, to find the most important center of woolen manufacture in this country. Other important centers are Lawrence, Massachusetts; Providence, Rhode Island; Lowell, Massachusetts; New York City; Manchester, New Hampshire; Camden, New Jersey; and Chester, Pennsylvania.

EXERCISE 5: Sheep Ranching on the Great Plains

1. Review the account of the wool industry and note the states in which sheep are extensively raised. In what regions are these states included? Look sharply at your rainfall map and make a statement relative to the annual rainfall.
2. Look sharply at Fig. 46. Do you think the region is excellent for grass? Is there a turf? How does the grass seem to grow? Such grass growing in the arid west is called "bunch grass." Why do the sheep scatter so? Of what value would these plains be if not used for grazing? Why, then, is sheep raising important in the states named?
3. Note the good friends in the foreground of the picture. Write two or three sentences giving your idea of the shepherd's life.
4. Why do you think the particular plains shown in the picture would not be equally valuable for cattle grazing? Which of the animals in question can feed closer? Can travel faster? Which can subsist on less water? Which can climb steeper slopes?
5. In sheep ranching, what are the two sources of income?
6. Think of reasons why the country shown in the picture is used almost exclusively for sheep ranching.

THE WHEAT INDUSTRY

Wheat thrives best where the winters are long and wet, with a sufficient cover of snow to protect the roots from the severe cold. The spring should be moist and cool, otherwise the wheat will not branch well, and consequently there will be fewer heads. These cool springs should give way to warm summers that become increasingly dry. Wheat requires warmer summers than either rye or barley, but cooler summers than corn.

Soil that is either too sandy or too clayey is not suited to wheat. If loam is not stiff or sticky, the heavier it is, the better it will be. This soil must be rich for the reason that the period during which wheat takes its nourishment from the soil is exceedingly short; for, by the time the

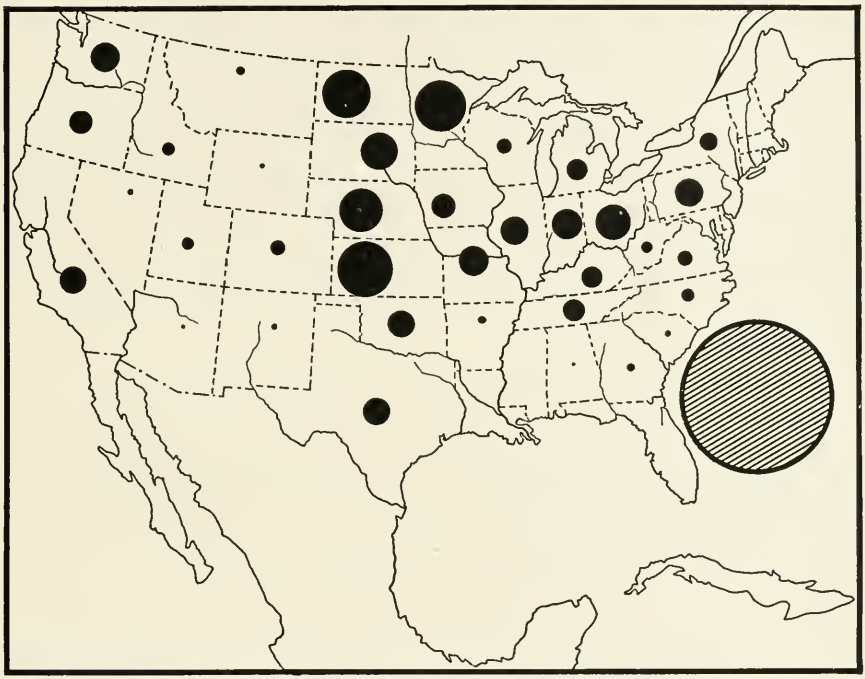

Fig. 49. — Average Yearly Wheat Production

crop is half grown, four-fifths of the mineral and nitrogen plant foods needed for its maturity have been stored up in the straws. The soil should be sufficiently level to permit the use of modern gang plows and reapers, yet rolling enough for natural drainage.

In early days the wheat-growing regions of the United States were Vermont, the Monongahela Valley, and the Susquehanna and Shenandoah valleys. Then, Baltimore was the chief milling center, though small, widely scattered " grist mills " were located wherever water power was available. With the completion of the Erie Canal in 1825, the

Genesee Valley became the center of the wheat industry, and Rochester, New York, soon surpassed Baltimore as a milling center. The first grain elevator constructed in the United States was built in Buffalo in 1843.

With the western migration that now rapidly set in, the center of the industry shifted from Rochester to Minneapolis. In 1854 the powerful St. Anthony Falls at Minneapolis were first used for the manufacture of flour. So rapidly did the industry develop that by 1901 the daily output of this single city was 60,000 barrels. While Minneapolis is the greatest flour milling city in the world, flour milling is also the leading industry in Kansas City and Toledo. Other centers are Evansville, Indiana, and Topeka, Kansas. Fort Worth, in the " black waxy " district of Texas, is the center of the industry for the southwest. Spokane, surrounded as it is by the most important wheat fields of the Pacific region, is the *Minneapolis* of the northwest.

EXERCISE 6: Beef Cattle in the Leading States

1. Consult the table below that gives the number of beef cattle in the United States; then make a graph of the five states having the greatest number of beef cattle.

2. Which of the above states are also leading dairy states?

3. Of the above states how many are in Western United States? Eastern? Central?

4. Wyoming and Arizona are frequently cited as great grazing states. How do they compare with Texas? Missouri? Iowa? Wisconsin? What states, even in Eastern United States, equal them? (See table below.)

5. Write a paragraph in which you show why Central United States is best suited to the growing of cattle.

Beef Cattle in the United States

(1912)

Missouri	1,504,000	New York	894,000
Texas	5,177,000	Michigan	701,000
Iowa	2,773,000	Pennsylvania	627,000
Kansas	1,872,000	Arizona	741,000
Wisconsin	1,146,000	Wyoming	568,000

PROBLEM 5: Why is Denver commercially Important?

1. Make a "pencil model" of Colorado. Locate Denver.
2. On what river is Denver? Is the river navigable? Of what value is the river to the city?
3. Enumerate the minerals found in Colorado. What conditions favor the smelting industry?
4. Consult a good relief map to ascertain the altitude of Denver. What distinction in this respect does the city bear? How does the altitude affect the city's commerce?
5. Examine a map of the United States. Find the approximate distances from Denver to Chicago; to St. Louis; to San Francisco.
6. Trace the Denver and Rio Grande Railroad across Colorado. What determines its course? Denver is sometimes called a "mountain gate" city. Why is this characterization fitting? What railroads reach Denver from the East?
7. Show that Denver is well located to serve as a distributing center for mining industries.
8. Why should Denver engage in the meat packing industry? In flour milling? Review your textbook to learn of Denver's industries. Record.
9. Why should Denver be a desirable residence city? Name three reasons.
10. State four reasons why Denver has become important commercially.

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Fig. 50. — A Rocky Mountain Scene

CHAPTER IX

THE ROCKY MOUNTAINS

GENERAL CHARACTER OF THE ROCKY MOUNTAINS

The Rocky Mountains extend from Alaska to Panama. Their greatest width, which is several hundred miles, is in the vicinity of Denver.

The name "Rocky" is very appropriate, for nowhere else in the United States can such vast stretches of bare rock be found. This is because the arid climate does not permit the growth of vegetation to cover the rocks, and because it is too dry to rapidly weather the rocks to form a mantle of soil.

Primarily this is a region of extensive plateaus, above which tower the mountains. We can better appreciate the plateau character of the country when we remember that Denver, situated on one of these plateaus, is farther above sea level than the summit of Mt. Washington.

Rising on the back of this plateau region are many lofty mountains. For a long time Pikes Peak was thought to be the highest of these mountains, but now more than a score of peaks are known to surpass it. Between these peaks are depressions known as passes, through which railroads are often built. Thus we read of Mullen's Pass, South Pass, etc.

High mountain valleys are called Parks. In Colorado there are four such parks: the North, Middle, South, and San Luis. They vary in elevation from 6000 to 10,000 feet, and are surrounded by mountains that are from 3000 to 4000 feet higher.

On the whole the Rockies are semiarid, for most of the moisture carried by the westerly winds is lost in crossing the Cascade and Sierra Nevada mountains. Only the higher slopes of the Rocky Mountains receive much moisture. For this reason the region contains much desert land, covered only with sage brush and cacti. There are, however,

wide stretches of land with sufficient rainfall for the growth of hardy grasses that provide pasturage for thousands of sheep and cattle. Grazing, therefore, is an important industry. While the west slope of the Cascade and Sierra Nevada mountains is covered with valuable forests, the Rocky Mountains, because of lack of moisture, have but limited areas that are well forested.

Agriculture in this region is possible only by irrigation. The rain, falling far up the mountains, forms mountain streams that flow across the more gentle slopes below. Since these streams are fed by melting snows as well as rains, their flow is constant; hence they are very valuable for purposes of irrigation. In Colorado extensive areas are abundantly supplied with water, and are under a high state of cultivation. In these irrigated districts fruit growing is particularly profitable.

Many small and picturesque lakes dot the region. These were formed by springs, and depressions that serve as reservoirs. Crater Lake in Oregon is one of the most famous of these lakes.

The Rocky Mountains constitute the treasure region of America, for practically all the useful and precious metals are found in abundance.

We think, therefore, of the Rocky Mountain region as being vast in extent, and containing so many scenic beauties that it is well called the wonderland of America. Not the least of the natural attractions is the Yellowstone National Park, with its beautiful lakes and waterfalls, together with its numerous geysers. Much of the region, however, is too rough to be tilled, and is not supplied with sufficient moisture for agriculture. Only in the mining of useful and precious metals does this region lead all the regions of the United States.

EXERCISE 1: Extent of the Rocky Mountain Region

1. This region includes the seven states through which the Rocky Mountains extend.

2. Using an entire page in your notebook, sketch first the outline of the group as a whole, then sketch the boundary of each state. Print in the name of each.

3. Compare the area of the largest state in this group with that of your own state. (See statistical table in your textbook.)

EXERCISE 2: Map Study

I

1. Consult your statistical table and find the area of Colorado. Compare with Wyoming, New Mexico, Arizona, and Utah. Tabulate your results.

2. Study your map carefully and decide which state is most mountainous. Locate four ranges and one peak in Colorado. Learn their names.

Fig. 51.—A Map Study, Park Mountains, Colorado

3. What part of Colorado is a high plain? Find the altitude of Denver.

4. Locate the sources of the North Platte, South Platte, Arkansas, and Rio Grande rivers. Why do these great rivers rise in the mountain valleys and not on the plains?

5. Study your map and learn what river drains each of the following natural parks: North, Middle, South, and San Luis. Why can these parks be called *intermontane* valleys? (See Dictionary.)

6. Remembering that the parks were once mountain lakes, what would you infer concerning the soils now found in them? Consult your textbook and reference books to find a statement describing these soils. Record.

II

7. Read your textbook carefully to learn the two most important agricultural products of Colorado. What is the annual rainfall in the state? Why do you think irrigation is necessary? Verify.

8. Locate one city in Wyoming noted for its mines and one in Colorado. Find a picture of a mining town in one of these states and be ready to describe it in your class recitation.

9. Secure a railroad map and trace the Denver and Rio Grande road through Colorado. What determines the direction of this road? Why?

10. State two reasons why Denver has gained a reputation for healthfulness.

III

11. Learn to sketch Colorado from memory, locating the chief mountains and rivers and the four leading cities. Reproduce your sketch in class.

EXERCISE 3: Products of the Rocky Mountain States

1. Read the descriptive matter in your textbook, noting the products of the Rocky Mountain States.

(*a*) In which states is sheep raising important? Print *Sheep* in these states, using outline map made in *Exercise 1*.

(*b*) What states mine gold extensively? Print *Gold* in these states. Do the same for *silver, lead, copper*.

(*c*) Learn from your textbook a city that is particularly important as a center for silver and copper mining. Indicate the position of this city on your map.

(*d*) Name two cities mentioned particularly in connection with the smelting of minerals. Indicate the position of each.

(*e*) Coal is mined extensively in but one of these states. Name it. Print *Coal* in this state.

(*f*) In what states are sugar beets grown? Indicate on your map.

EXERCISE 4: Population of the Rocky Mountain States

1. From the statistical table in your textbook, ascertain the population of Wyoming; of Arizona.

2. Compare the combined population of the Rocky Mountain States with

that of New York State. Give two reasons why this region is so sparsely populated.

3. Locate the capital of each state. Which capital has a population greater than that of the others combined? How do you account for the absence of large cities?

THE BEET SUGAR INDUSTRY

Since beet sugar now comprises fully three-fifths of the world's commercial sugar crop, it merits careful consideration. The rapid development of the beet sugar industry is one of the accomplishments of the last half century, for as late as 1853 six-sevenths of all the sugar consumed was produced from cane.

The sugar beet is a white variety of the common beet, and grows wild in the countries about the Mediterranean Sea. It belongs to the family of biennials; by this we mean that two years are required for its flower and fruit. It grows from seed, and during the first year simply stores up in its large, fleshy root a surplus of food to be drawn upon the second year, when it produces flowers and fruit. At the end of the first year man interferes and gathers up this stored-up plant food for the production of sugar.

To successfully grow the sugar beet we must have a loamy soil, rich in potash; and it should be deeply plowed and well harrowed. Since the amount of sugar depends, not so much on the size of the beet as on the quality of the juice, and as this depends upon the richness of the soil, it is highly desirable to keep the soil properly fertilized.

The beets are ready to pull in September or October, when they should average sixteen inches in length, and should weigh about one and one-half pounds each. At the factory they are cut into thin chips which are thrown into hot water — the solvent power of the water extracting most of the juice. Later the remaining juice is pressed from the chips. The process of manufacturing sugar from beet juice is very similar to that employed in the manufacture of cane sugar, and will, therefore, not be repeated.

When compared with the world's product, the output of the United States is insignificant; but when considered in the light of the number of pounds we produce, the industry is fairly important. In 1907–1908

Colorado produced 292,000,000 pounds, Michigan 170,000,000, Utah 91,000,000, Idaho 64,000,000, and Wisconsin 33,000,000.

Inasmuch as the competition between the producers of cane and beet sugar is so keen, we will briefly examine the beet sugar industry in the light of the cane sugar industry.

1. Cane can be raised with but little labor, while with beets a large amount of labor is necessary.

2. Beets require replanting each year; not so with cane, for one planting will do for several years.

3. Cane is grown in subtropical regions where there is an abundance of cheap labor; beets are grown in the temperate zones where labor must be more highly paid.

4. Beets are grown where population is densest, hence near the market for the finished product. Cane sugar must be taken long distances to the market.

5. Beets are produced in regions where there is an abundance of capital which favors the erection of excellent manufacturing plants.

6. In the manufacture of beet sugar the refuse is highly valuable as a food for stock. Cane deprived of its juice is burned.

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CHAPTER X

THE COLUMBIA PLATEAU

HISTORY AND RESOURCES OF THE COLUMBIA PLATEAU

By the Columbia Plateau we mean the broad stretch of country between the Cascades and Rocky Mountains; in Oregon, Washington, and Idaho, the region is drained by the Snake River in the south and by the Columbia River in the north.

Long, long ago this region was extremely rugged, being characterized by many lofty mountain peaks, between which were deep, steep-sided valleys. At a later period huge fissures formed in the earth's crust, from which flowed vast quantities of liquid rock, or lava. "This lava was squeezed out as a result of mountain growth, somewhat as the water rises through a crack in the ice over a frozen pond." These lava floods, however, occurred at different times, for some are so old that they have been upheaved and dissected by streams, while others are smooth and unweathered, as if very recent. Indeed, this great plateau has been built up by successive and overlapping lava flows until the volcanic rock, into which the lava hardened, is in places a mile thick. This is shown in the canyon of the Great Snake River, where the dividing line between the old rocks and the lava, or basaltic rock, is very apparent. Often between successive lava flows, long periods of time elapsed, during which the basaltic rock decayed at the surface, forming excellent soil. Vegetation and sometimes forests grew in this lava soil only to be swallowed up when later a great fissure permitted a fresh outflow of the viscid, molten rock to flood the country for hundreds of miles. Lignitic coal and petrified woods, found in portions of the plateau, are evidence of the life history of the plateau, as here outlined.

These successive lava flows filled the old valleys, forming lava-like plains above which the summits of the ancient mountains appeared in

island-like masses. In many instances as the cooling lava flowed forth it dammed valleys, forming lakes. These lakes have long since disappeared, but their beds are now rich agricultural lands, so level that

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FIG. 52. — HARVESTING WHEAT, WASHINGTON

they can readily be tilled. Lava when decayed forms the rich, fine-textured soil which is the basis for the immense wheat industry of the northwest.

The rainfall of the Columbia Plateau is very inadequate, though it is greater than that of the Great Basin. Fortunately the soil is well suited to "dry farming"; often the rivers supply an abundance of water for irrigation. The climate of Oregon and Washington is much milder than that of Massachusetts, which is in the same latitude. Only in the upper levels are the winters severe and the snowfalls heavy. The valleys are sheltered and have an equable climate.

In the main the Columbia Plateau is " a vast expanse of treeless undulations stretching away to a horizon almost as level as that of the sea." The barren surface supports a vegetation of sagebrush and bunch grass, sufficient in places for grazing purposes. Near the Rocky Mountains the rainfall is more generous and the wheat industry is important.

DRY FARMING

By dry farming we mean the profitable production of crops without irrigation, on lands that have a yearly rainfall of less than twenty inches. The chief purpose of dry farming is the reclamation for the use of man of the vast, unirrigable, semiarid areas of the world, which hitherto have been thought hopelessly barren.

The importance of dry farming is apparent when we consider our extensive areas of arid and semiarid lands. According to Professor Henry of the United States Weather Bureau, nearly one-half the United States receives an annual rainfall of twenty inches or less. These areas of slight rainfall include eighteen states. The dry farming territory has more than one billion one hundred ninety-one million acres. Surely these figures should provoke a lively interest in our subject.

Even an elementary study of dry farming must first include a consideration of soils. The soil in semiarid or arid regions is much more productive than that of humid regions. The reason is that in the latter, as the rainfall constantly drains through the soil into the standing ground water, it subjects the soil to a perpetual soil wash. This water, as it leaches through the decayed vegetable matter on the surface, becomes charged with carbon dioxide and hence acquires great solvent power. It is then able, in the downward movement, to take up in solution many soil constituents and carry them away.

In no other respect does the soil of humid and arid areas so differ as in the nature of the subsoil; for indeed arid districts may be said to have no true subsoil. In regions of abundant rainfall a great distinction usually exists between the subsoil and the soil. The soil is rich in humus and is modified by various cultural operations. The subsoil is an accumulation of fine clay, lime, and other soil ingredients, which, through the action of heavy rainfalls, have leached from the overlying soils. It is

so compact that roots find it very difficult to enter it, and in fact so little air can penetrate it that it remains unweathered and raw.

In arid regions, moisture in the form of a film about each soil grain, slowly moving downward, is unable to carry the clay and other soil particles. As a result the finer soil particles remain in the soil, instead of collecting beneath it as an impervious subsoil. A marked characteristic of the soil of arid districts is that the soil and subsoil are about equally porous. This permits the air to move freely to a great depth and so weather the soil as to render it suitable for plant nutrition. The roots can also penetrate deeply. The most important advantage is that it constitutes an ideal storage for water away from sunshine and winds.

Some semiarid districts, for example parts of the Dakotas, have a distinct subsoil. Instead of the heavy clay subsoil of humid districts we find here a layer of hardpan. This is the clay, lime, and other soil ingredients leached from the overlying soil. This layer of hardpan is very undesirable from the standpoint of dry farming. A further hindrance is gravel seams, for in breaking up the continuity of the soil mass, they prevent the upward movement of water stored in the soil depth. From the above it is seen that the prospective dry farmer should avoid land having streaks of gravel or layers of hardpan; and that he should insist upon a soil of uniform structure to a depth of at least eight feet.

Over most of the semiarid regions the rainfall comes in the winter, leaving the growing season rainless. The chief problem then in dry farming is the storing in the soil of the rain that falls in any season until it is needed for plant growth. To accomplish this the dry farmer must as far as possible prevent the direct evaporation of water from the soil, for in arid regions it is by evaporation that most of the water is lost. Unfortunately in dry-farming territory, the rate of evaporation is very great, often ranging from six to thirty times the precipitation. This is usually due to high temperatures, abundant winds, and low relative humidity.

A good method of decreasing the rate of evaporation is to form a protective mulch, or thin layer of dry soil, over the surface. The loss by evaporation occurs almost wholly at the surface. This surface evaporation may continue, however, until the soil moisture is depleted to a depth

of ten feet or more, for the water passes by capillary movement from the soil depth to the surface. A protective mulch decreases the rate of evaporation for the following reason: As soil water diminishes, its capillary movement is retarded. The drying of soil may continue until the capillary movement wholly ceases.

Early spring cultivation is necessary if the stored soil water is to be retained. Since the rate of evaporation is greatest when the soil is wet, much of the needed moisture will escape if the farmer permits the early spring days to slip by before he begins spring cultivation. During the summer the most important time to cultivate is immediately after each rain. These summer rains quickly establish connection with the store of moisture in the soil, and are hence often a disadvantage rather than an advantage, as they quickly draw from the deeper soil the stored-up moisture.

If dry farming is to succeed, the farm must be located in a section having a rainfall of ten inches or more, and with the least possible wind movement. The soil should not contain layers of hardpan or streaks of loose gravel, but must be uniform in texture to a depth of eight feet. This is necessary to promote the development of root systems and permit the storage of moisture away from sunshine and wind. After the land has been cleared, it should lie fallow for one year; in fact, it should never be sown until sufficient moisture has been stored in the deep soil to insure a crop.

That very dry soil and water even repel each other may be seen by driving along a road immediately after a slight rain. The wheels show that the dust is wet only on the surface. Accordingly, a surface layer of very dry soil prevents the deeper soil water from reaching the surface, since it destroys the capillary movement of soil water. That there would be almost no evaporation from the surface of this dry mulch is apparent. Naturally a chief concern in dry farming should be the forming and preserving of such a protective mulch.

The dry farmer must use exceptionally good judgment and be persistent in the cultivation of his soils. Deep fall plowing will permit the winter's precipitation to sink quickly into the soil depth. The seed should not be sown until enough moisture has been collected to insure

a successful crop, for it is only the dry farmer who has his deep soil well stored with moisture that can go into the summer with any assurance. The most successful method of collecting the rainfall for successive years for a single crop is by clean fallowing, or resting the ground a season with proper cultivation. Ground clean fallowed and covered with a carefully prepared protective mulch is in the best possible condition to receive and retain moisture. King[1] has shown that soil, clean fallowed, was able to carry over nine pounds more moisture per square foot than adjoining land.

The dry farmer should keep in mind that his is a system of agricultural practice that requires the constant application of skill and intelligence. But he may be assured that whenever correct methods are applied, the results will be satisfactory.

EXERCISE 1: Dry Farming

Read the foregoing account of dry farming for answers to the following:

1. What is dry farming?
2. Why is it so important?
3. Why is the soil in semiarid regions richer than elsewhere?
4. Why are we not likely to find "hardpan" in semiarid regions?
5. Of what advantage is the fact that the soil is loose and porous to a depth of eight feet or more?
6. What is the most important problem of the dry farmer?
7. What do we mean by a protective mulch? How is it formed? Of what use is it?

EXERCISE 2: Map Interpretation

1. In answering the following, the pupil is required, by consulting maps, to refer to parts of the country and to features, by *name*. *Questions refer to Fig. 70.*
2. Locate two ranges or groups of mountains. Which are higher?
3. In which part of the state will there be likely to be forests? Why?
4. Where are there lowlands? Where a plateau?
5. Where will *dry farming* be practiced? Why?
6. Why does the main stream receive no tributaries from the south and east?
7. What is the northern latitude of this state? Where will the inhabitants experience cold winters? Where mild?
8. Where will population be densest? Why?

[1] F. H. King, *The Soils.*

9. Select two locations at which cities should grow. Give adequate reasons in each case.

EXERCISE 3: The Wheat Industry in Washington

1. Make a light-and-shade sketch of Washington. Draw the Columbia, Snake, and Spokane rivers. Locate Olympia, Seattle, and Spokane.

2. Write a paragraph describing the surface of the state. Contrast especially eastern and western Washington.

3. From a relief map learn the approximate altitude of Spokane and the country south.

4. Consult your textbook to learn something of the soils of western Washington. They are of what origin? Are they productive? Why?

5. From a rainfall map, learn the annual precipitation of eastern Washington. Does wheat require much moisture to mature it?

6. Find a statement, if possible, concerning the temperature of western Washington. (Consult a map showing isotherms.)

7. In 1911, Washington produced 36,000,000 bushels of wheat. What conditions favored this enormous production? Summarize them.

8. Graph the wheat crops of Washington, Minnesota, and North Dakota in 1911, the productions being:

Washington	36,000,000 bushels
Minnesota	40,000,000 bushels
North Dakota	65,000,000 bushels

9. Explain why Spokane is sometimes called the *Minneapolis of the Northwest.*

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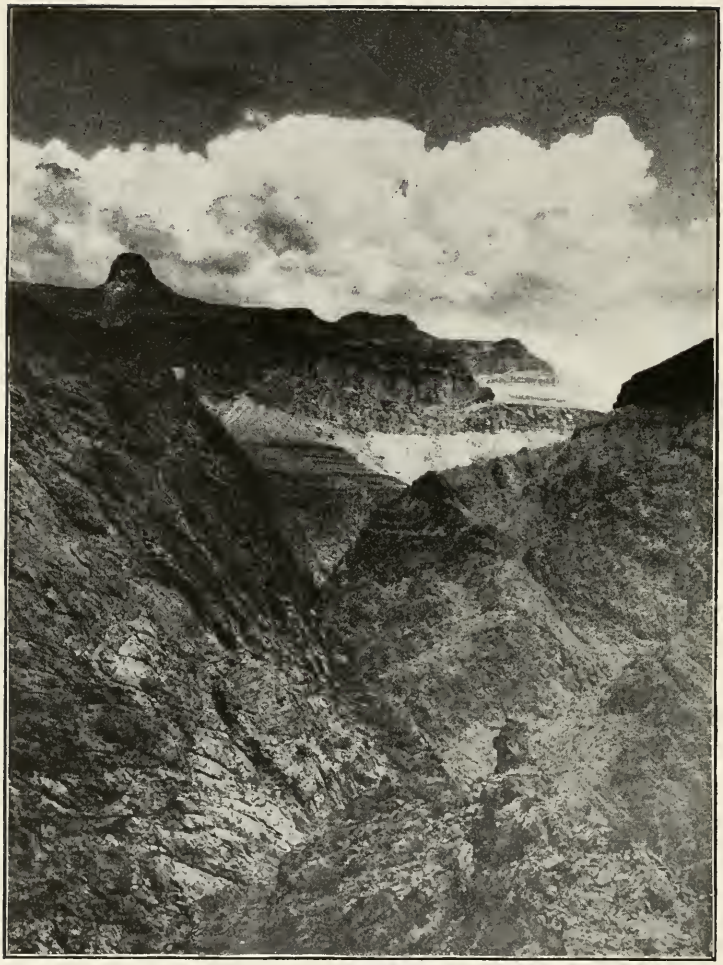

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FIG. 53. — A GRAND CANYON SCENE, ARIZONA

CHAPTER XI

THE COLORADO PLATEAUS

GENERAL CHARACTER OF THE COLORADO PLATEAUS

Long years ago an extensive arm of the Pacific Ocean covered the area now occupied by western Colorado, eastern Utah, and northern Arizona. The region is now a series of high and desolate plateaus known as the Colorado Plateaus. Beneath the shallow water, thick beds of sedimentary rock were formed. Later the region was very slowly uplifted, and these thick beds of rock were broken into huge blocks. The edges of these tilted blocks form cliffs. So irregular was the uplift that many basins were formed in which lakes of fresh water collected. Thus, for a long time, this was a region of extensive fresh-water lakes. The gradual uplifting continued, however, until at present the region is from 6000 to 8000 feet above the sea. Rivers have long since drained the lakes or they have disappeared by evaporation.

The period of uplift was also one of intense volcanic activity. Numerous volcanic cones were formed over the plateau, and in many places there were small lava flows. These volcanic cones have gradually wasted away so that only volcanic necks remain to tell of their existence. (See Fig. 53.)

The rainfall is everywhere slight because of the high mountains to the west. It is most abundant on the more elevated and cooler parts, where, in places, it is sufficient for the growth of forests. The plains are so dry that only plants of the desert type are found. Throughout the region, scattered tufts of grass provide meager pasturage for the herds of cattle and sheep that are to be found here.

The entire region is drained by the Colorado River and its tributaries. Far to the northeast, the Green and Grand rivers unite to form

the Colorado. Since these rivers have their sources far up in the mountains, they are fed by the melting snows as well as by the rainfall that these mountains intercept; as a result, they have a constant supply of water. The Colorado is in many respects the most wonderful river in the world. Like a great saw, it has cut a canyon that is marvelous in its proportions. "If its sublimity consisted only in its dimensions, it could be sufficiently set forth in a single sentence. It is more than two hundred miles long, from five to twelve miles wide, and from five thousand to six thousand feet deep. But it is not magnitude alone that gives this canyon its prominence; it is the gorgeous and varied coloring of its mighty walls, the endless detail in the sculpturing of its battlements and towers, the ever-changing atmospheric effects of its profound depths, and the wonderful stimulus to the imagination with which it feeds the mind."[1]

This region has an advantage over the Great Basin since it is better supplied with water for irrigation. The Roosevelt project in southern Arizona is a good type of the kind of work the government is doing to redeem the arid districts of the entire West.

But little of the Colorado Plateaus can be farmed by ordinary methods. How much can be dry farmed is at present uncertain. The hope of the entire region is in irrigation, and the opening of the Roosevelt project has ushered in a new era of prosperity.

EXERCISE 1: Extent and Origin of the Colorado Plateaus

1. Sketch in a group the following states: Wyoming, Utah, Colorado, Arizona, New Mexico. Draw the Colorado River with its three important tributaries. Print their names neatly. Learn to spell them.

2. From Fremont Park in western Wyoming draw a line to the sharp bend in the Colorado River in southeast Nevada, thence southward through Phœnix and eastward to Albuquerque, and northward through Leadville to Fremont Park. Consult your map and be exact in the location of these places. The area included is known as the Colorado Plateaus.

3. Read carefully the description of the Colorado Plateaus in this chapter and be prepared to tell your teacher during the recitation the story of its formation.

[1] Dutton.

EXERCISE 2: Surface and Soil of the Colorado Plateaus

1. Study the picture in Fig. 54, and write a short paragraph contrasting the surface shown with that of your own region.

2. What evidence can you find that there is soil on the slopes in the foreground?

FIG. 54. — SURFACE AND VEGETATION OF ARIZONA

3. Describe two kinds of vegetation shown in the picture. What kind of plant is shown in the lower left-hand corner? The lower right-hand corner? Why is vegetation so sparse in this region?

4. Study the picture in Fig. 53, and contrast the shape of the valley with that of the valley in Fig. 54. What is a deep, narrow valley called? Account for the absence of soil in Fig. 53.

5. From the preceding description of the Colorado Plateaus learn how the rounded hill shown in Fig. 53 was formed, and be able to explain in the recitation.

6. What canyon is this? How does it compare with other canyons of which

you have read? How was it formed? Write a short paragraph about the canyon shown in Fig. 53.

7. Read the descriptive matter in your textbook, gleaning statements regarding the surface, soil, and plant life of the region. Give two specific instances in which the pictures verify your textbook material.

EXERCISE 3: The Colorado River

1. What two rivers unite to form the Colorado River? Sketch and label these rivers, also the Colorado.

Fig. 55. — The Capitol, Phœnix, Arizona

2. Sketch three rivers that enter the Colorado from the east. Why are there no important tributaries from the west?

3. With the aid of the scale compare the length of the Colorado with that of the Ohio River.

4. How many large cities do you find on the Ohio River? On the Colorado? Account for this difference.

5. Consult Fig. 41 and compare the navigability of the Ohio River with that of the Colorado.

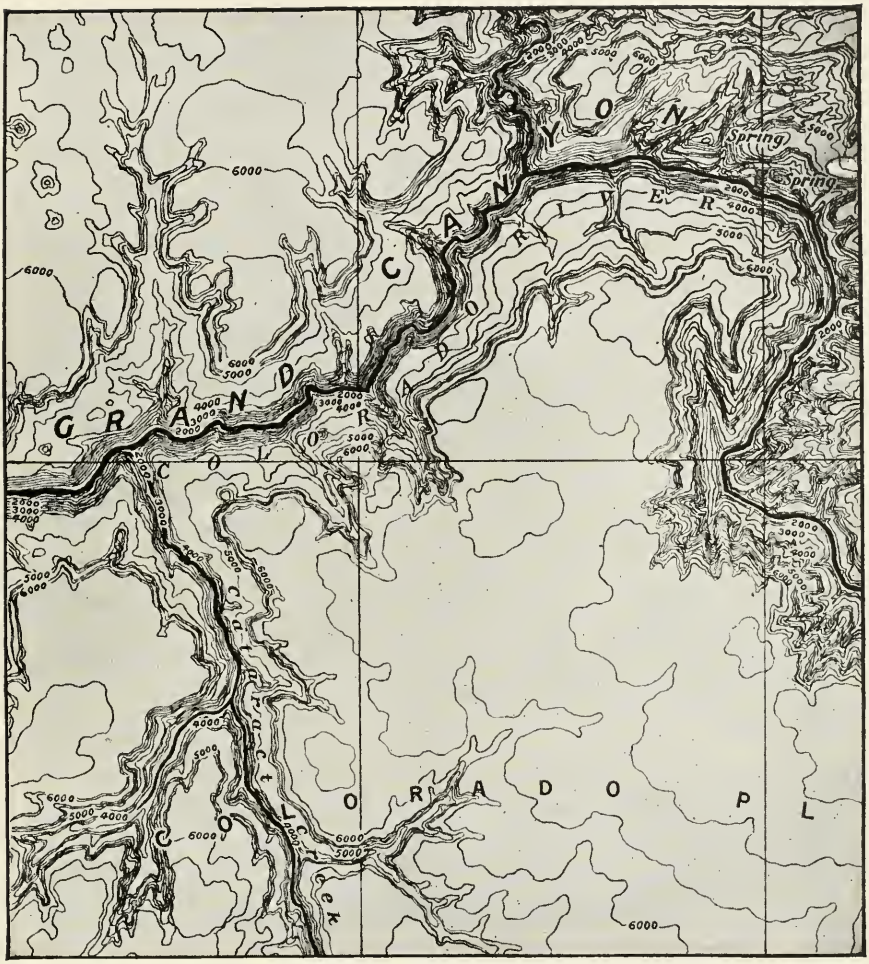

FIG. 56. — A PORTION OF THE KAIBAB SHEET
Scale, about 8 miles to the inch. Contour interval, 250 feet

6. In what state is the Grand Canyon? Read the subject matter in your textbook, also the material in this chapter, and be able to describe the canyon to your teacher during the recitation.

EXERCISE 4: Population of the Colorado Plateaus

1. Consult a good map for the names of cities that are within the plateaus. Read material in your textbook, also in this chapter, and account for the absence of cities.

2. What does the fact that there are no cities suggest regarding the density of population of the plateaus? Verify your inference from statistical tables in your textbook.

3. What is the area of Colorado? Its population? Its population per square mile?

4. In the same manner find the population per square mile in Utah.

5. Write a short paragraph in which you give two reasons for the sparsity of population of the Colorado Plateaus.

EXERCISE 5: (Optional) A Study of the Colorado River, Kaibab Sheet[1]

1. How many miles of river are shown on this map? About how wide is the river?

2. What is the contour interval? Where are the contour lines close together? What does this indicate?

3. Locate Cataract creek. How much above sea level is the Colorado River near the mouth of this creek? How much above the sea is the neighboring plateau? How deep, then, is the canyon? How wide?

4. Why are so few streams shown on the area included in the map? Account for the absence of villages and towns.

5. How many hilltops do you observe on the map? Look at the map and learn whether there are lakes and swamps in this region.

IRRIGATION IN THE UNITED STATES

The importance of irrigation is readily seen when we are told that according to conservative estimates there are in the United States 45,000,000 acres that are capable of irrigation. If all these lands were irrigated, one-half our present population could move upon them, and even then there would be no overcrowding.

[1] See page 10.

The rapid increase in population in the United States has created such a demand for land that the government has now undertaken the task of irrigating these vast areas. Why should the government irrigate the land, is sometimes asked. The answer is, that successful projects are too large and expensive, and too slow to produce returns, to tempt individuals to undertake them. Already the government has about thirty such projects under way of construction. (See Fig. 57 for the location of several of these projects.)

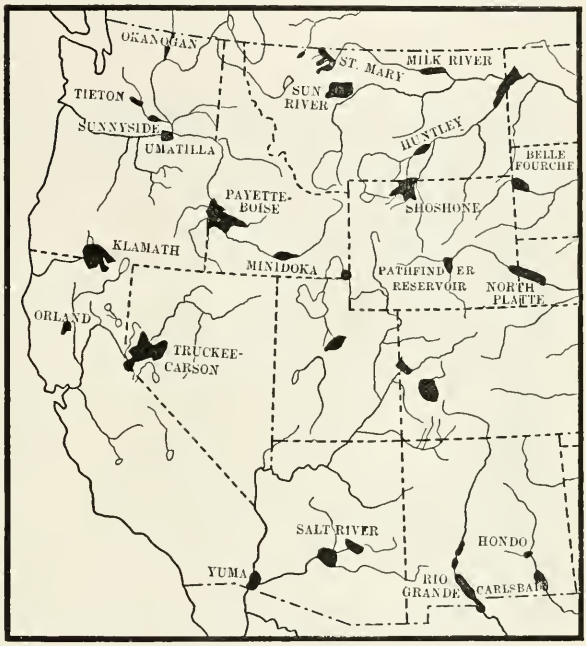

FIG. 57. — FEDERAL IRRIGATION PROJECTS

The funds for these projects are derived from two sources: First, the government receives the proceeds from the sale of all public lands in semi-arid states; and second, whenever a project is completed, the land thus supplied with water is sold for enough per acre to pay the cost of the project. Up to date the cost per acre has been between $40 and $50. As irrigated land is highly productive, the government finds no difficulty in selling the land as soon as it is supplied with water.

EXERCISE 6: Irrigation

1. Sketch an outline map of Arizona. Trace in the following rivers, — Colorado, Little Colorado, Gila, Salt.

2. Indicate the position of Phœnix. Using the scale in your book, check a point on the Salt River seventy-five miles above Phœnix.

3. Examine Fig. 58. What dam is here shown? It is in the canyon of what river? What natural condition has favored the building of a dam at this point? (This dam is 280 feet high and 1089 feet long.)

4. In Arizona most of the rain falls in July and August. During what season is it needed most? Why then? When is the Salt a large river? When is it very small? Can you suggest the reason for building the dam?

Fig. 58. — The Roosevelt Dam, Salt River, Arizona

5. Find the picture of an irrigation ditch in your textbook. Why has it been dug? The Roosevelt Dam provides water to irrigate 200,000 acres. The cost of the dam is $10,000,000. The government built the dam and charged its cost against the land irrigated. What is the cost per acre?

6. How do you think the building of this dam will affect the productiveness and settlement of this region?

7. Thirty other similar projects have either been completed or are under construction in the arid districts of the West. If possible locate and name some of them.

8. The following paragraph emphasizes the importance of a liberal supply of moisture. Study the paragraph and be prepared to review it in your class recitation.

"The best portions of our country have an annual rainfall of 30 to 60 inches, such regions being well suited, so far as moisture is concerned, to agriculture. Farm crops cannot be produced successfully where the annual rainfall is much below 20 inches, though the introduction of 'dry farming' is overcoming to some extent the lack of moisture. Where the annual rainfall is below 10 inches, the country becomes nearly barren, bunch grass and sage brush being common forms of the sparse vegetation. In regions of generous rainfall, forests abound. In Washington, where the annual precipitation is from 60 to 100 inches, stand the majestic fir forests. Forests gradually disappear on approaching arid lands or deserts. In cold or arid regions, nature conserves the limited amount of moisture by decreasing the evaporation area of foliage. Hence the 'needle' of conifers is a moisture adaptation, as is the total absence of leaves in certain desert species. Again, the roots of some desert plants attain a length equal to five times the height, so eager are they to secure moisture." [1]

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[1] *The Teaching of Geography*, by W. J. Sutherland, page 30.

CHAPTER XII

THE BASIN REGION

ITS HISTORY; DISTRIBUTION OF POPULATION

The Great Basin is a vast arid tract lying mostly in Nevada and Utah. The term *Basin* is likely to mislead us into thinking that the region is very low, when, in reality, practically all of the valleys rival plateaus in their elevations. The bottom of the Great Salt Lake is more then 4000 feet above the sea.

The bottom of this basin is not a monotonous plain, as the term might suggest, but consists of independent mountain ranges with broad flat-floored valleys between them. These ranges were formed by the cracking of huge beds of rock, and a movement up and down these cracks so that the rock on one side stands much higher, forming what is called a *fault*. Usually each block or ridge has been so tilted that it has one steep and one gentle slope. After these blocks were thus uplifted and tilted, lava burst from beneath and built, in many places, peaks and small plateaus.

The broad level-floored valleys between these north-south ranges stand at an elevation of from 4000 to 6000 feet, and are formed of the gravelly and stony waste washed down and deposited to a depth of hundreds and even thousands of feet. The wasting away of the mountains has supplied materials to partially fill the valleys.

The chief drawback to the fertility of the Great Basin is its slight rainfall, which nowhere exceeds ten inches and, over large areas, does not reach one-half of that amount. A further drawback is that even the light rainfall comes almost exclusively in winter, when it is likely to fall in heavy downpours of short duration. Floods are not unusual. Should the rain fall gradually, much of it might be retained; but since it comes in torrents, it runs off quickly. The rapid rate of evaporation in this region further renders it difficult to retain the moisture in the growing season.

Most of the streams of the Great Basin, born of a single downpour, spread out in shallow sheets and disappear after a few hours of sunshine. Streams that do not immediately evaporate form shallow lakes that are short-lived; soon all that reminds one of the heavy winter torrents are the broad areas of sun-baked mud called "playas." There are a few streams able to survive throughout the year. Among these are the Bear, Sevier, Humboldt, and Truckee rivers.

This region was not always arid. Indeed, at one time this entire area was covered with a vast inland sea. At a later time the sea largely disappeared, leaving the region broken by extensive lakes. So large were these lakes that their ancient shore lines are discovered a thousand feet up the sides of adjacent mountains. Practically all of the existing lakes are shrunken remnants of much larger lakes, and are even now fast decreasing in size. The characteristic lakes of the Great Basin are alkaline and bitter. They are salty because the tributary streams that feed them, like streams everywhere, carry a small amount of salt and mineral matter in solution. Water after reaching the lakes can escape only by evaporation, which always leaves the salts or mineral matter behind.

But scattered over the Great Basin are occasional fresh-water lakes. The largest of these is Lake Utah. This lake owes its freshness to its elevation, which enables it to discharge its waters into the Great Salt Lake.

As one might expect, the light rainfall generally limits the growth of vegetation. Throughout the broad valleys only the sagebrush, the thorny cactus, and the spiny yuccas can be seen. The floors of the driest basins are white with crusted salt and entirely without vegetation. The upper slopes of some of the higher ranges intercept moisture and are forested, though most of the range slopes are barren.

The wealth of the region lies in the salt and other mineral products found in the lake basins, and in the precious metals stored in the mountains.

Virginia City, the most famous mining town in the Great Basin, is built above the famous Comstock Lode, which has yielded many millions in gold and silver. So rich was this single vein that, on account of it, Nevada once produced more gold than any other state, and more silver than all of them put together.

Not including Salt Lake City, the Great Basin has about one person per square mile. The people are not distributed evenly over the country, but are grouped in mining towns and wherever water can be had for irrigation.

EXERCISE 1: Extent of the Great Basin

1. On an outline map of the United States, beginning at the mouth of the Colorado River, trace a line north and east, being careful not to cross the Colorado, or any of its branches, until you reach Wyoming. Now trace the line west and north without crossing any of the tributaries of the Snake or Columbia rivers. You should reach the Cascades near the middle of Oregon.

2. From central Oregon turn due south, following the western boundary of Nevada as far as Truckee Lake; thence along the slope of the Sierra Nevada Mountains until you reach the point from whence you started. Label the area *Great Basin*.

3. In tracing the above line, did you cross any rivers? Does the Basin region send a single stream to the sea? What becomes of the water that falls on this area?

4. What states are wholly within the Great Basin? Portions of what other states are included in it? Answer as follows: "Southwestern California lies in the Great Basin."

5. What is the area of Nevada? From this, estimate the area of the entire region. How does it compare in area with your own state?

6. Why is this region called a "basin"? Has it a "rim"? What once occupied the Basin region? What, then, marks its limits?

EXERCISE 2: Rainfall of the Great Basin

1. In what wind belt is the Great Basin? With arrows indicate the direction in which these winds cross this region.

2. From what ocean do these winds blow? Over what mountains must they pass?

3. Contrast the temperatures at the foot and top of a mountain; why the difference?

4. How is the temperature of these winds changed as they cross the mountains? How does this change in temperature affect their capacity for moisture? On which side of the mountains, then, will much moisture fall? Why will but little rain reach the Great Basin?

5. What do you infer concerning the annual rainfall in the Basin region?

After consulting a rainfall map, record the annual precipitation in Michigan, in Florida, and in Nevada.

6. Select other sections of the United States having light rainfall because of mountains. Record these sections.

EXERCISE 3: The Soil Resources of the Great Basin

1. Read carefully the description of the Great Basin in this chapter. How much above sea level is the bottom of Great Salt Lake? Contrast the elevation of your home region with that of the Great Basin. How high is Mt. Washington? Compare its altitude with that of the floor of the Great Basin.

2. What is the rainfall of your own state? Of the Great Basin? Compare the two. Are spring rains in any country particularly valuable? Why? Give three reasons why the rain that falls in the Great Basin does little good. Record these reasons.

3. On your map sketch in the Great Salt Lake. Why is this a "salt" lake? Locate a large fresh-water lake that is near it. How is the fact that the waters in this lake are fresh accounted for? (See pp. 152–153.) Could the waters of both lakes be used to irrigate the land? Why are there so few fresh-water lakes in the Great Basin? Why, then, is it impossible to irrigate extensively?

4. What is the population per square mile in Nevada? How does this region compare in density of population with your own state? Why is this region likely never to become densely populated? Why will the people who dwell in the region not be distributed evenly over the country? Write a paragraph to explain where the settlers will reside. Will agriculture ever become a leading industry? Why?

5. Why is the Basin region not an important grazing area?

6. Why do you think the soils are productive if well watered? Verify your inference, if possible, by reference to your textbook.

EXERCISE 4: The Natural Resources of the Great Basin

1. Consult a map in your textbook that shows the states included in the Great Basin. Locate Carson City, Ogden, Salt Lake City. Indicate the position of each on your sketch prepared in Exercise 1. What is the population of each city? Read carefully the descriptive matter in your textbook and tabulate the industries of each city. For what is Salt Lake City particularly noted?

2. Examine a map showing the distribution of minerals in the United States. Make a list of those found in the Great Basin. Does this region seem

to be rich in mineral wealth? What would you infer, then, to be the leading industry in Nevada? Does the descriptive matter in your textbook verify the inference?

3. Do you think that the Great Basin is forested? Why? Consult a forest map of the United States and verify.

4. Consult pictures of mines in your textbook and elsewhere. Use stereoscopic views showing mining processes.

5. Read one story of the mining industry from a geographical reader. Review the story in the recitation.

PROBLEM 1: Why are Cities and Towns more Numerous in the Vicinity of Great Salt Lake than elsewhere in the Great Basin?

1. Sketch an outline map of Utah. Draw Great Salt Lake. Using the scale, determine its length and average width. Record.

2. Locate and name two cities on this lake. Compare their combined population with that of the state as a whole. Record.

3. Draw two rivers that empty into Great Salt Lake. Examine your map to see whether this lake has an outlet. How many other lakes in the Great Basin have no outlets? Why are they all salt-water lakes? Why cannot salt water be used for irrigation?

4. Draw and label a lake that has its outlet into Great Salt Lake. Why is this a fresh-water lake? Why would irrigation be highly developed just north of this lake?

5. The river that enters the Great Salt Lake from the north is called the Bear River. Name four important towns on or near this river. What does the presence of these towns suggest regarding irrigation north of Great Salt Lake?

6. Examine a map and think of a reason why there are no cities immediately west of Great Salt Lake.

7. Write concisely the chief reason why there are more towns in the vicinity of Great Salt Lake than elsewhere in the Great Basin.

EXERCISE 5: Density of Population

1. Consult Fig. 59. Do the states represent nearly all sections of the United States? Of what value is this?

2. Select two states in northeastern United States. Compare their density of population per square mile. Account for the difference.

3. In what region does Illinois belong? Name the other states that belong

to the same region. Give two reasons why this entire region is densely populated.

4. California is the most densely populated state on the Pacific Slope. Compare its population per square mile with that of Illinois. Account for the difference.

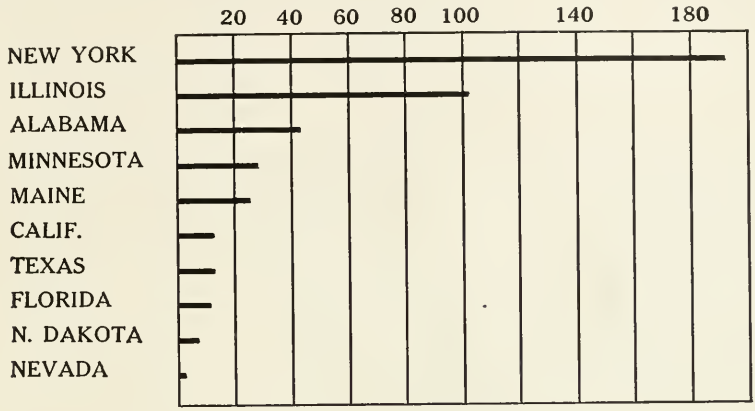

Fig. 59.— Density of Population, 1910

5. The density of population of Texas is about the same as that of the other states of the Great Plains. Name these states. Why are the Great Plains more sparsely populated than the Prairie Plains? If in doubt, consult a rainfall map of the United States.

6. To what region does Nevada belong? Name the other states that belong to this region. Why is this region so sparsely populated? Do you think it will ever be thickly settled? Give reasons for answer.

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CHAPTER XIII

THE PACIFIC SLOPE

GENERAL CHARACTER OF THE PACIFIC SLOPE

The Pacific Slope in the United States includes the region that lies west of the crest of the Sierra Nevada-Cascade Mountains. The region naturally divides itself into three parts: To the east there are the Sierra Nevada-Cascade Mountains; to the west the Coast Ranges; while between there is a broad depression known as the Great Valley.

Examine your maps and you will observe that the Sierra Nevada-Cascade Mountains constitute a single system that stretches entirely across western United States. The Sierra Nevadas are 400 miles long, 70 miles wide, and lie wholly within the state of California. So lofty are these mountains that their jagged peaks reach altitudes of from 10,000 to 14,000 feet above the sea. Their eastern slopes are precipitous, descending rather abruptly to the Great Basin; their western slopes are more gradual, dipping gently into the Great Valley. It may aid in imaging these mountains if we think of a huge block, uplifted along the eastern margin, and dipping westward. So steep is this eastward front that it constitutes an effective barrier to westward migration. Nowhere else in the United States, not even among the Rockies themselves, do we find so continuous a range of very lofty mountains as the Sierra Nevadas.

The western slope, unlike the eastern, is so very gradual that one is reminded of a tilted plateau rather than of a mountain side. To climb this westward slope it would be necessary to make a journey of 40 miles in which one would cross wonderful forests of coniferous trees. At the foothills we would pass through a belt of oak forests, above which is a belt of yellow pines. Above the yellow pines is the most important belt of all, including sugar pine, sequoia, fir, spruce, and cedar, clothing the higher slopes to an elevation of 9000 feet. Above this, to an elevation of 11,000 feet, are junipers and alpine pines.

The Cascade Mountains are more broken and less lofty than the Sierras. Rivers break through them, often forming falls and cascades from which the range is named. The elevation of the Cascades is about 8000 feet. This range includes a number of lofty peaks that are the cones of extinct volcanoes. The westward slope of the Cascades, like the Sierra Nevadas, is clothed with a magnificent forest of giant trees.

The mountains fringing the Pacific Ocean are included in a system known as the Coast Ranges. These mountains are young; in fact they are now in process of building, hence the earthquake shocks in 1906. Unlike the Sierra Nevadas these mountains are not high and are thoroughly dissected. Often they are so near the sea that their precipitous cliffs descend directly to the ocean.

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FIG. 60. — LUMBERING IN WASHINGTON

Among the Coast Ranges are many large and fertile valleys now extensively given over to fruit growing. With the exception of their southern extent these ranges are densely forested. Here are the celebrated forests of redwood which include a strip about 25 miles wide, extending from San Francisco to the southern boundary of Oregon. It is significant that the redwood cannot be found at a distance greater than 25 miles from the sea. Some idea of the value of these forests may be had when we are reminded that a single acre often yields 50,000 feet of lumber.

Between the Coast Ranges and the Sierra Nevada-Cascade Mountains is a vast depression known as the Great Valley. This valley was formed

by a bending down of the earth's crust. Several times in its history this region has been so depressed that it has been beneath the sea. During the periods when it was an arm of the sea, sediment was carried from the mountains that were on either side, and deposited to a depth of thousands of feet. The soil is therefore an accumulation of sand and clay washed down from the mountains.

In California two great rivers drain the valley: the San Joaquin from the south, and the Sacramento from the north. The total length of the valley within the state is 400 miles, and its width is 40 miles.

The southern part of the Great Valley receives but scanty rainfall, and much of it presents a semiarid appearance. The western slope of

Fig. 61. — Log Rollways on Wisconsin River

the Sierra Nevada Mountains, however, receives much more rainfall than the valley itself. The streams that have their sources in these mountains are led in ditches out across the dry valleys, transforming them into veritable gardens; for, when well watered by irrigation, they are exceedingly productive. In the southern half of California these valleys are devoted to the cultivation of oranges, lemons, figs, olives, and raisin

grapes. In the cooler valleys the peach, prune, apricot, cherry, pear, and grape are grown. Apples thrive on the lower mountain slopes. Though fruit is exceedingly important, it is not grown in all the valleys, for many of the larger ones are devoted to the growth of cereals.

The northward extension of the Great Valley is known as the Willamette Valley. It is extremely fertile and under a high state of cultivation. Here dairying is more important than elsewhere on the Pacific Slope.

In climate, the Pacific Slope differs widely from the eastern states in the same latitude, and closely resembles western Europe: California having its counterpart in Spain and Italy, and Oregon and Washington in the British Isles. The variations in temperature are due to altitude and distance from the sea, rather than to latitude, for the climate in the northern part of the region is nearly as mild as in the southern part. The temperature of the coastal lowlands is remarkably equable. The average July temperature of Eureka, California, is 55 degrees Fahr., while the average January temperature is 46 degrees. Similarly San Francisco has a July average of 58 degrees, and a January average of 50 degrees. Surely this is in marked contrast to conditions within the continent or on the eastern coast; for St. Louis has a July temperature of 78 degrees and a January temperature of 33 degrees. Even though the Great Valley is 100 miles from the sea, its climate is greatly tempered by it, and oranges can be grown as far north as the 40th parallel.

The lowland along the Pacific coast is the only region in the United States in which the rainfall is wholly seasonal, — a rainy season and a dry season. The dry season is during the summer, when the land is warmer than the water; hence the winds coming from the Pacific are heated upon reaching the land, and their capacity for holding moisture is increased, therefore they appear as dry winds. In the winter, the colder land chills the air from the ocean, causing rain. In southern California the total rainfall is from 10 to 20 inches, and comes in the form of occasional showers during the winter. The rainfall gradually increases as one goes up the coast until in Oregon and Washington it often reaches 70 inches and even more, falling about daily from October until May. Here the rainfall is heavier than in any other part of the United States.

The Great Valley is the most productive region in the far West. The soils are composed of the finer waste of the mountain slopes; the temperature is equable; the rainfall in the Willamette Valley, and the more meager precipitation of the Sacramento and San Joaquin valleys, assisted by irrigation, altogether make this part of the Pacific Slope region remarkably productive.

PROBLEM 1: How does changing the Temperature of Air affect its Ability to hold Moisture?

I

1. The following table shows the amount of water vapor a cubic foot of air can hold at different temperatures.

20° F.	1.2 grains
30° F.	2 grains
40° F.	2.8 grains
50° F.	4 grains
60° F.	5.8 grains
70° F.	8 grains
80° F.	11 grains
90° F.	15 grains

2. How many times more moisture can a cubic foot of air hold at 90° F. than 30° F.?

3. If saturated air is chilled, what is sure to result?

4. If saturated air at 70° F. be warmed to 80°, how much more water can a cubic foot hold?

5. Explain fully what will happen if the air in 4 cools to 50° F. How much moisture will it lose?

6. What causes frost to form?

7. Why does air deposit moisture in crossing mountains?

8. Why is rain very frequent along the Pacific coast during the winter season?

9. Why do you think warming air always dries the region over which it passes?

10. State concisely how the warming or cooling of air affects its ability to hold moisture.

PROBLEM 2: Why is the Winter Temperature of Western Washington and Oregon so Mild?

I

1. What is the latitude of Portland, Oregon? Of Portland, Maine? Of Duluth, Minnesota? Of Moscow, Russia?

2. What is the January temperature of Portland, Oregon? Of Portland, Maine? In like manner compare the temperatures of Seattle and Duluth. To secure these facts select a map which shows "January Isotherms." [1]

3. Note carefully the location of Seattle. Determine its approximate elevation above the sea. Compare its altitude with the altitudes of Duluth and of Portland, Maine.

4. From a rainfall map learn the annual precipitation at Seattle, at Duluth, and at Portland, Maine. Which of these cities receives its rainfall during the winter months?

5. What are the prevailing winds at Seattle, at Duluth, and at Portland, Maine?

II

1. Why can you not attribute the difference in winter temperature of Seattle and Duluth to differences in latitude?

2. Why can you not attribute the differences in temperature to differences in altitude?

3. Compare the temperatures of the Pacific Ocean and the coastal lands in January. Why will the winds that bathe the coast in January be warm? Why will they be moist?

4. What force causes water to vaporize? When steam or moisture condenses, what is set free? How does condensing steam affect a radiator? What effect will frequent winter rains have on the temperature of the region?

III

1. Select three or four statements from your textbook relating to the winter temperature of western Washington and Oregon.

EXERCISE 1: Ocean Currents

1. Consult a map in your textbook that shows the ocean currents of the world. Name the current in the Pacific Ocean that bathes the shores of North

[1] See Longmans' *New School Atlas.*

America. On your outline map of North America indicate by arrows the position and direction of this current. In about what latitude does it cross the Pacific Ocean on its way to North America? What part of our continent is in the same latitude? What do you know about the climate of this latitude? What would you infer, then, the temperature of this current to be when it reaches North America? (The influence of the Japan Current upon the climate of North America has been overestimated.)

2. Name the chief current in the Atlantic that touches North America. Indicate by arrows the position and direction of this current. In about what latitude does it cross the Atlantic in its eastward course?

3. What do you infer concerning the temperature of the waters of this current as it passes through Florida Strait? How will the temperature change as the waters drift eastward? To what extent can such waters influence climate?

4. Indicate by arrows the Labrador Current. From what ocean does it flow? What do you think will be the temperature of this current? Exactly what part of North America is affected by this current? Why?

EXERCISE 2: Products of California

1. Make a graph that shows the following statistics, which are for 1911:

Gold	$20,000,000
Hay	$13,000,000
Petroleum	$9,000,000
Wheat	$8,000,000

2. From a map in your textbook showing the distribution of precious metals in the United States, make a list of all the states that produce gold. How does California rank?

3. From a map showing the distribution of natural gas and petroleum, and from Fig. 67, learn the centers of petroleum production. How important is the California field? Compare the output of petroleum with that of wheat in California.

4. Record the three agricultural products in the order of their importance. From 1900 to 1910 the number of cattle, sheep, and horses in California was doubled. How would this affect the production of hay? What parts of California do you think are best suited to the production of hay? Why? If in doubt, consult description of the Pacific Slope in this chapter.

5. Read account of dairying in Chapter V, then give a reason for the rapid increase in the production of hay and the decrease in the production of wheat.

EXERCISE 3: Forests of the Pacific Slope

1. Sketch neatly the Pacific Slope states. Draw the Sierra Nevada-Cascade Ranges, also the Coast Ranges.

2. With the aid of the scale in your textbook determine the distance of each from the sea.

3. Read the subject matter in your textbook, also pp. 158–162 of this manual, for answers to the following:

   a. What are the prevailing winds that blow over these mountains? With arrows indicate the direction in which they cross the mountains.

   b. On which slope of the Sierra Nevada-Cascade Ranges does most of the rain fall? Why? Answer fully.

   c. With the aid of a rainfall map of the United States compare the rainfall of the western slope of these mountains with that of the Great Valley. Why the difference?

   d. Why are the forests on the western rather than the eastern slopes of these mountains? Do you think there are forests in the Great Valley? Give reasons for your answer.

   e. Make a list of four important trees grown in these western forests. Name a noted tree grown only in the Coast Ranges.

4. Examine carefully Fig. 60, then write a paragraph in which you contrast this forest scene with a typical forest scene in your own vicinity. Account for the difference.

EXERCISE 4: Lumber Output of the Leading States

1. Make a simple graph to show the following statistics, which are for 1910:

Washington	4,200,000,000 board feet
Louisiana	3,600,000,000 board feet
Mississippi	2,200,000,000 board feet
Oregon	2,100,000,000 board feet
Wisconsin	1,800,000,000 board feet
Texas	1,800,000,000 board feet
Arkansas	1,600,000,000 board feet
North Carolina	1,600,000,000 board feet
Michigan	1,500,000,000 board feet
West Virginia	1,400,000,000 board feet

EXERCISE 5: Denver to San Francisco

FIG. 62. — THROUGH THE MOUNTAINS

1. Trace the course of the Denver and Rio Grande R.R. from Denver to San Francisco.[1] Estimate the distance by rail.

2. Fig. 62 shows one view of Royal Gorge. Its walls of granite often rise to a height of 2500 ft. Look carefully at the picture and think of one good reason why the Denver and Rio Grande R.R. pursues such a round-about course.

3. What rivers does this route follow? Why?

4. Name two historic places through which it passes.

5. Fig. 63 shows a view on the plains. Which view do you like better? Why?

6. Locate Oakland, the western terminal. From a railroad time table, learn the number of hours it takes to make the journey, and estimate the cost.

7. Name two resources of the country through which the Denver and Rio Grande and Western Pacific railroads pass.

[1] From Salt Lake City to Oakland the service is over the Western Pacific Railroad. The route crosses the plains of Nevada where the scenery, shown in Fig. 63, is characteristic. Down the western slope of the Sierras the route follows the beautiful cañon of the Feather River for nearly a hundred miles.

FIG. 63. — ACROSS THE PLAINS

FRUIT GROWING

Oranges

In 1911 California shipped to the markets of Eastern United States 40,000 carloads of oranges. Practically all of these oranges were grown south of the 37th parallel, especially in the vicinity of Los Angeles; for inland from this city are the largest and best orange groves in the world.

Should we visit Redlands, located in the heart of the orange belt, we should find orchards in all stages of development. To start an orchard the grower purchases from nurseries the small trees at a cost of about one dollar each. These he sets in rows twenty feet apart. As the rainfall is slight, especially during the summer, it is necessary to " pipe in the water from the mountains."

Usually under favorable conditions an orchard begins to bear the fourth year and continues to bear for forty or fifty years. On the same tree may be seen blossoms, half-grown fruit, and ripened fruit. Packing begins in November and continues until March.

Though the orange industry in California has reached such large proportions, the Professor of Horticulture in the University of California estimates that but one-tenth of the suitable orange land is under cultivation.

Lemons

The growing of lemons in California is comparatively recent, and is not extensive. The present output is 2000 carloads yearly. The lemon tree is more susceptible to cold than the orange tree, hence it is grown near the coast in the very southern part of the state. Like the orange tree the lemon is a perpetual bearer.

Until very recently most of our lemons were supplied by Mediterranean countries, especially Sicily, which may be said to have a monopoly on the lemon industry. As lemon culture in California is proving profitable, its rapid expansion may be expected.

According to the 1900 Census, the five leading fruit states in our country are, in order, California, New York, Pennsylvania, Ohio, and Michigan. California produced a little more than one-fifth of all the fruit grown.

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FIG. 64. — ORANGE CULTURE, SAN GABRIEL VALLEY, CALIFORNIA

EXERCISE 6: Fruit Growing in California

1. Turn to the map you drew of the Pacific Slope states. Draw the Sacramento and San Joaquin rivers. What is the general trend of each river? Between what mountain ranges does each flow? What is the area of this valley in square miles?

2. With arrows indicate the direction of the prevailing winds over this valley. Record the name of these winds.

3. How do these winds affect the temperature of the region during the fall? Why is this an advantage to fruit growers? Why are the springs so late? In what way is this favorable to the fruit industry?

4. How do the Coast Ranges affect the rainfall of the San Joaquin and Sacramento valleys? How, then, is water supplied for fruit growing? Glean statements from your textbook regarding irrigation in these valleys.

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FIG. 65. — HOP RAISING, OREGON

5. Consult your textbook, then make a list of six kinds of fruit grown in California. Indicate the section in which the citrus fruits are grown. Why there? From what city are most of these fruits shipped?

6. Locate on your map the region shown in Fig. 64. Infer three reasons why the San Gabriel Valley is well adapted to fruit growing.

EXERCISE 7: A Willamette Valley Industry

1. Examine Fig. 65. What is the crop?

2. Judging from the growth of vegetation, what do you think of the productiveness of the soil? Judging from the location, what is true of the rainfall?

3. How is the crop shown in the picture harvested? For what purpose is it used? (See Dictionary.)

4. When does the rainy season begin in this region? Why might wet weather injure this crop? Think of one good reason why this crop is grown largely in the Willamette Valley.

EXERCISE 8: Salmon Fishing in the Columbia River

1. Sketch in a group the following states: Washington, Oregon, Idaho.

2. Draw the Columbia River with its four leading tributaries. Print neatly the names of these tributaries. Their sources are in what mountains?

3. Locate Astoria, Portland, Salem, Vancouver. Consult your textbook for statements regarding the industries of these cities. Record your answers. Which city is the center of the salmon industry? How do you account for this?

4. How is the rapid decline in the number of beef cattle in the United States affecting the consumption of fish?

5. How are salmon usually prepared for shipment? People of what nationality are chiefly engaged in this industry? (See Fig. 66.) Why are these people employed?

6. Read the subject matter in your textbook, also the following account of salmon fishing, and be prepared to tell the teacher during the recitation the life story of the salmon.

SALMON FISHING

Should you go far up the tributaries of the Columbia River, you would find that in most instances these streams have their sources in small lakes. It is in these lakes that the young salmon are hatched, and here they remain until they are about an inch in length, when they start to drift slowly down the river. In their downward course it is interesting to observe that they drift with their heads up stream, that they may the more easily secure food. Often this journey to the ocean is so long that it requires weeks and even months. When the ocean is reached, the young salmon make their home near the shore. From three to four years are thus spent in the salt water, during which time they grow rapidly until a single salmon sometimes weighs 100 pounds, though the average weight is 22 pounds.

When the time draws near for the female to lay its eggs, these mature salmon, both male and female, start up the river. As they leave the

ocean they are sleek and plump, but immediately upon entering the fresh water they lose their appetites, eating but little during the remainder of their lives. Often it is with extreme difficulty that they make their way up the swift streams abounding in rapids and cataracts. During the upward course the salmon change rapidly. Instead of remaining plump and sleek as when they left the ocean, they become thin, battered, and worn. In spite of hardships, the instinct to ascend the stream is so great that they will not stop until the source of the stream, usually a quiet lake, is reached. Here the pair dig a nest in the sand in which the female deposits from 2000 to 6000 eggs. Now that their work is done they make no attempt to again reach the ocean, but soon die in the fresh waters of the stream or lake.

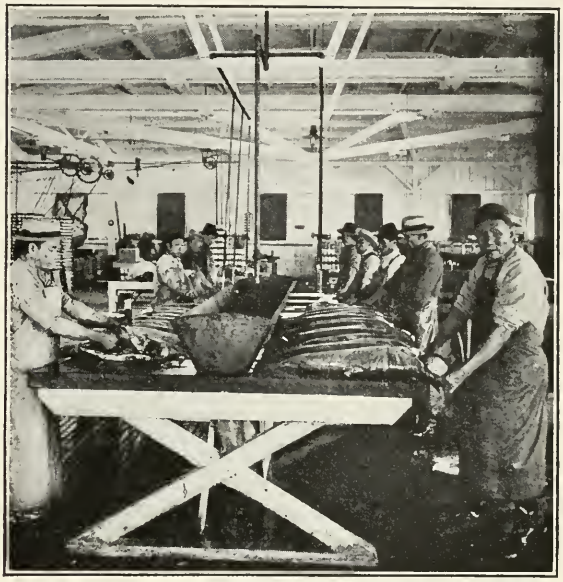

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FIG. 66. — BUTCHERING SALMON

It is in this upward journey that the salmon become a prey to the fishermen, who have many devices for catching them. A good example of such devices is the gill net, which is so stretched across the current that the salmon in their attempt to go up stream "put their heads through the meshes, which catch behind the gills and hold them fast." Another device is the salmon trap that operates on the same principle as the wire fly cage.

PETROLEUM

The word *petroleum* means rock oil. It is secured by boring into the earth, whence it gushes or is pumped out. As it comes from the earth it is a dirty brown color and gives off a very disagreeable odor.

Scientists have several very interesting theories to account for the origin of this rock oil. According to one of these theories petroleum has been extracted from huge beds of limestone. By taking the bones and shells of sea animals and placing them in a retort and distilling them, the scientist has found it possible to obtain the same substances that are found in petroleum. Since limestone is but an enormous collection of shells and animal remains, it is natural to presume that when thick beds of limestone are subjected to heat and pressure, they may yield large quantities of petroleum.

Though petroleum has existed for millions of years, it is only within the lifetime of those now living that it has come into extensive use.

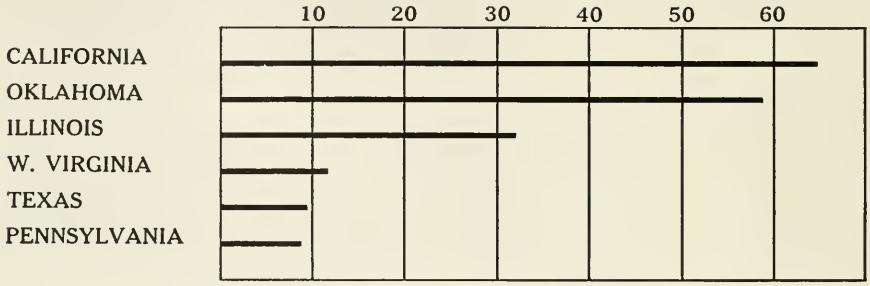

FIG. 67. — AVERAGE OUTPUT OF PETROLEUM, 1910 TO 1912
(In million barrels)

The first oil well in the United States was sunk at Titusville, Pennsylvania, in 1859. It may aid us in fixing the date of the most rapid development of the oil industry if we associate it with the stirring days of the great Civil War, for its marvelous expansion caused almost as much excitement in Pennsylvania as did the war itself.

Before petroleum can be used for lighting purposes several impurities must be removed. The process of removing these impurities is called refining. The first process in refining is distilling, or separation of one liquid from another by heat. The crude oil is therefore heated in containers, so large that each holds hundreds of barrels. The substance that goes into vapor at a low temperature, such as gasoline, naturally passes off first. The temperature is then increased until kerosene is driven off. Finally the heating is continued until the heaviest oils, those used for

lubricating purposes, are driven off, leaving a thick substance called residuum.

The methods of transporting petroleum are interesting. Near each well is a large tank in which the petroleum is stored. From this tank it is next taken to the refinery. At first it used to be carried in barrels, later in iron tanks, and now it is carried either in tank cars, tank steamers, or conveyed in pipes laid on the surface of the ground. In laying one of these pipe lines all the tanks in a given field are first connected, then their contents transported by means of a larger pipe to a distant city where the refineries are located. At convenient intervals along the line there are pumping stations to force the oil along. At present such pipe lines connect our oil fields with Cleveland, Baltimore, Philadelphia, New York, and Chicago. The Standard Oil Company alone has over 4000 miles of pipe line now in operation. Furthermore tank steamers, loaded at American refineries, carry oil to nearly all ports of the world, for this has a wider sale than any other of our exports.

EXERCISE 9: Oil and Gas

1. What two kinds of rock are shown in Fig. 68? Which rock contains the water, which the oil, and which the gas? Does the downward or upward fold contain the gas? How can you account for this? Why should the salt water settle in the downward fold? Why should the oil be between the gas and salt water?

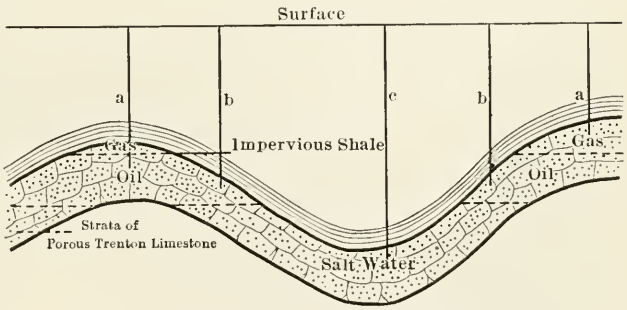

Fig. 68. — Oil and Gas Deposits

2. A drill at *a* would strike what deposit? at *b*? at *c*? Why do not all the strata contain these deposits? How can you account for the fact that a gas well often becomes an oil well? When an oil well begins to yield salt water, what would you infer?

3. Consult a map in your textbook showing the distribution of oil and gas in the United States. How many distinct fields are there? Write a short

paragraph in your notebook in which you give the location of the four largest fields, being careful to mention the state or states in which each is found.

4. Are there sections in the United States that are practically without oil or gas? Name them in your notebook.

EXERCISE 10: Petroleum

1. Consult Fig. 67. What is the combined output of the states shown?

2. Which of the states shown in this figure was first to produce petroleum? What is its present rank? Why the change? What do you think the future of the industry in this state will be?

3. Are the petroleum-producing states well distributed? Of what advantage is this? What section of the United States has least petroleum? Most?

4. Tabulate four of the products of petroleum and tell how each is produced. (See pp. 171–173.)

5. Why is the per capita consumption of kerosene decreasing? Why is the per capita consumption of gasoline increasing?

EXERCISE 11: Percentage of Cultivated Land to Total Area

1. Consult Fig. 69. What percentage of the area of Iowa is under cultivation? What does this suggest as to rainfall? Verify by reference to a rainfall map in your textbook. What does it suggest as to temperature?

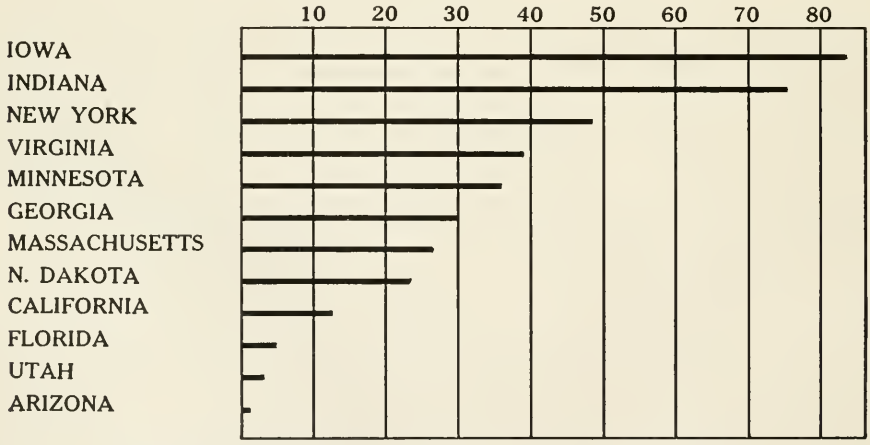

FIG. 69.—PERCENTAGE OF CULTIVATED LAND TO TOTAL AREA

As to fertility of soils? As to surface? Select two or three statements from your textbook that seem to verify your answers.

2. What percentage of the area of Arizona is under cultivation? From a rainfall map determine the annual precipitation in Arizona. Write a sentence in which you give the chief reason why so little of Arizona is under cultivation.

3. What percentage of California is under cultivation? Examine a relief map and give the chief reason why so much of the land is not cultivated.

4. What percentage of Florida is cultivated? Why so little? Consult the subject matter in the textbook to verify.

5. About what percentage of your state is under cultivation? What conditions seem to determine the extent of cultivation?

6. Write five conditions that good cultivable land should possess. How will the absence of any one of these conditions affect the percentage rank of a state?

EXERCISE 12: Distribution of Population in Washington and Oregon

1. Draw an outline map of Washington and Oregon. Sketch the Cascade Mountains. Trace and label the Columbia, Snake, and Willamette rivers.

2. On which side of the Cascade Mountains are cities and towns more numerous? What does this indicate? Do you think conditions for agriculture are more favorable east or west of the mountains? Explain.

3. Consult the rainfall map of the United States found in your textbook. On which side of the Cascades is the rainfall heavier? Remembering the direction of the prevailing winds, account for this difference in rainfall. What influence would this difference have upon the density of population of the districts in question? Select statements from your textbook regarding climate in these states. Do they verify the inference you have made?

4. Is the great lumber industry possible both east and west of the Cascade Mountains? Consult a forest map of the United States found in your textbook. Glean statements from your textbook regarding the distribution of forests in these states. How do you account for the way in which the forests are distributed? How would the removal of these forests affect the density of population of this region?

5. In what section east of the Cascades are towns and cities fewest? What does this indicate? Do you think conditions for agriculture are more favorable in western Oregon or western Washington? Explain.

6. Discuss in a short paragraph the distribution of population in Washington and Oregon.

FIG. 70. — CHARCOAL MODEL OF WASHINGTON AND OREGON

EXERCISE 13: Cities of the Pacific Slope

1. Turn to the map of the Pacific Slope states in your notebook. Print neatly in their proper places the names of six important cities in this region.

2. With the aid of the statistical table in your textbook, compare the combined population of these cities with that of Chicago.

3. Why are there so few cities on the coast?

4. Why are cities more numerous in western Washington than in western Oregon? Name the two largest cities on Puget Sound. What is the leading industry of each?

5. Account for the large number of cities in the vicinity of Los Angeles. In what special industry are the people of this portion of the state engaged? Show why this industry is profitable.

PROBLEM 3: What Geographic Conditions have made San Francisco the Metropolis of the Pacific Coast?

I

1. Sketch San Francisco Bay. Give your reasons for believing that it is a good harbor.

2. Locate San Francisco. Using the statistical table in your textbook, compare its population with that of Seattle; of Los Angeles.

3. What mountains skirt the Pacific Coast? How near to the sea do they seem to be? Where do you find an opening through these mountains? Consult a railroad map to learn how many railroads take advantage of this opening.

4. Use the scale and determine about how many miles north of San Francisco one must go to find another opening through the mountains through which railroads pass. How many miles south? How does the lack of openings through the mountains affect the trade at San Francisco?

II

5. Write a paragraph in which you contrast the shore line of California and Oregon with that of New England.

6. How many miles north of San Francisco is the first good harbor? How many miles south? How does the absence of good harbors affect the trade of San Francisco?

7. Consult Webster's New International Dictionary for the meaning of

the term "hinterland." Recall the two river valleys that constitute the most productive portion of the San Francisco hinterland. About what is the area of their basins? See pp. 160–162. Read the subject matter in your textbook, then make a list of the important products of this hinterland.

8. Write three reasons why San Francisco is the metropolis of the Pacific Coast.

EXERCISE 14: The Leading Cities of the United States Engaged in Foreign Trade

1. The percentage of foreign trade passing through our leading ports is as follows:

New York	45%
New Orleans	7%
Boston	6%
Philadelphia	6%
Baltimore	4%
Galveston	6%
San Francisco	3%

2. Make a graph to show this data.

3. Compare the foreign trade of New York with that of the other six cities. What conditions have favored the development of such an extensive foreign trade at New York?

4. Of the foreign trade, as indicated in the graph, what percentage passes through Pacific Coast ports? Why do you think the Atlantic ports are so much more important?

5. Tabulate the important exports of each city as follows:

New Orleans	*a.* Cotton
	b. Sugar
Galveston	etc.

EXERCISE 15: (Optional) Mt. Shasta, Shasta Special Map

1. Locate Mt. Shasta on a map in your textbook or atlas.

2. Determine its height from the Shasta Sheet. Record. Compare with Pikes Peak. Record.

3. Why are there glaciers near the top of Mt. Shasta? Count them. On which side are the contours closest together? Why are there no glaciers on this side?

Lava
Hotlum Glacier
Shastina
Mt. Shasta
Whitney Glacier
Bolam Glacier
Watkins Glacier
Konwakiton Glacier
Bolam Glacier
Whitney Glacier
Lava
Bluewer
Konwakiton Glacier
Watkins Glacier
Hotlum Glacier
Shastina
Mt. Shasta
Lava
Konwakiton Glacier
Watkins Glacier
Bolam Glacier
Whitney Glacier
Hotlum Glacier
Bluewer
Lava
Konwakiton Glacier
Watkins Glacier
Bolam Glacier
Whitney

Fig. 72. — Mt. Hood, Oregon

4. Find two "lava flows" on the Shasta Sheet. Find two "cinder cones." What do these features suggest? What *is* Mt. Shasta to-day? What was it once?

5. Find the 7000 ft. contour line.[1] Try to trace it entirely around Mt. Shasta. Do other contour lines run parallel to this one? What is the general form of Mt. Shasta? How was it formed?

6. Look in your textbook for a picture of Mt. Shasta. Look up any reference concerning it in the descriptive matter. Locate Mt. Rainier and Mt. Hood. Distinguish between volcanoes and mountain peaks. What is an *extinct* volcano?

7. Describe the feature that impresses you most in the picture of Mt. Hood.

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[1] Since the numbers are rather difficult to read on the reduced maps, it is urged that schools procure the original U. S. G. S. maps recommended on page 10.

CHAPTER XIV

OUR AMERICAN POSSESSIONS

ALASKA

Alaska, our frontier wonderland, is a country twice as large as Texas and one-sixth as large as the United States. For this vast area, in 1867, we paid Russia the sum of $7,200,000. At that time many people ridiculed our government for paying a sum that seemed so large, for a region that was thought to be little else than snow and ice. That the purchase was no mistake is shown by the fact that Alaska has already produced precious metals, sea and fur products, valued at more than $400,000,000.

Everywhere Alaska is fringed with a shore line that is very irregular. Skirting the shore are hundreds of picturesque islands, back of which are narrow rock-bound arms of the ocean, called *fiords*. A very narrow coastal plain has been made by the uplift of the ocean bed exposing a strip of lowland.

Alaska is mountainous, the Cordilleras including many majestic peaks, among which are Mt. McKinley and Mt. St. Elias. From lofty summits hundreds of glaciers descend slowly to the ocean, where huge blocks of ice float away as icebergs. The surface of Alaska includes the Pacific Mountain system, the Central Plateau, the Rocky Mountain system, and the Arctic Slope region.

Since one-half of Alaska is in the North Frigid Zone, the winters are long and severe and the summers cool and short. On the south coast the climate is equable, the winters being mild and the summers cool. The rainfall is heavy, and much of the weather cloudy and unfavorable to the tillage of crops.

The central plateau has a drier climate, the precipitation occurring largely west of the Coast Mountains. The summers are short, but, owing to the high latitude, the summer days have nearly twenty hours

of sunshine, and vegetation develops rapidly. The winters are cold, but the dry, clear atmosphere makes the climate quite endurable.

The soils of Alaska are the result of glacial action and of alluvial deposits. Old lake beds abound in accumulations of decaying vegetable matter, sometimes forming peat. Often the decaying vegetation and abundance of moisture produce a mucky, sour soil. Such soils must be treated with lime to make them productive. Nearly all of the tillable land must be cleared of timber and a thick protecting coat of moss before it can be utilized for agriculture. The Department of Agriculture, through its science experts, has demonstrated that vegetables, small fruits, and forage crops can be grown over wide areas. Stock raising seems to promise a successful future. It is estimated that there are 7,000,000 acres of tillable land, lying largely in the Tanana Valley, besides 60,000,000 acres that can be utilized for grazing.

Fishing and whaling are the leading industries. The great variety and number of fishes make this industry one of the greatest in the world. There are many land animals, and land and water birds. The Kodiak brown bear is the king of carnivorous animals, and the moose is the largest of its kind. Reindeer exist in large herds, and mountain sheep and goats are numerous. Great numbers of seals are secured on the Pribilof Islands, to which they migrate during their breeding season.

The mineral resources of Alaska are vast and widespread, the leading minerals being coal, copper, and gold. Rich copper mines have been found along Copper River and in the region of Prince William Sound. Gold has been found in large quantities in the gravels of the Klondike, a tributary of the Yukon River. Nome, in the Tanana Valley, also, is famous. The coal reserve has been estimated to be twice that consumed to the present time by the United States.

The National Government has appropriated money to project railroads into this *wonderland,* and commercial advantages will no doubt lead to rapid development along many lines.

THE PHILIPPINE ISLANDS

Before the Spanish-American War the people of the United States knew little of the Philippine Islands. It was not until a fleet of Spanish

war ships took refuge in Manila Bay that our attention was called to them. The account of the seizure of the Spanish fleet by an American fleet under the command of Admiral Dewey is familiar to all. Admiral Dewey then took possession of the Philippine Islands in the name of the United States. At the close of the war we purchased the islands from Spain at a cost of $20,000,000.

The length of the Archipelago is more than 1000 miles and the width more than 500 miles. There are in all about 3000 islands; only twelve, however, are of any considerable size. The two largest are Luzón and Mindanao, each about equal in extent to the state of Kentucky.

The islands are volcanic, hence the soil is fertile. Though there are valleys of great fertility, the islands as a whole present a very rugged surface. Less than 5 per cent of the land is under cultivation.

The entire group is within the Torrid Zone; hence the climate is truly tropical. There are three seasons: From November until February the climate is dry and temperate; from March until May it is dry and hot; from June until October it is hot and very rainy. This rainy season is due to the equatorial calm belt that visits the islands at this time.

The Philippine Islands are rich in natural resources. The forests are among the finest in the world. The deposits of mineral wealth are extensive. The greatest single hindrance to the development of the country has been the poor transportation facilities. Often the forests are so dense that it is very difficult to construct roads. During the rainy season the roads are often impassable. When the islands came into the possession of the United States, practically all the people lived along the shore or on the short navigable rivers.

Within the past few years hundreds of miles of railroad have been built.

The exports in the order of importance are: hemp, sugar, copra, and tobacco.

HAWAII

The Hawaiian Islands are in the same latitude as Cuba, and are about one-third of the way across the Pacific Ocean.

The entire group is small, not equal in area to the single state of New Jersey. Only eight of the islands are inhabited, and nowhere is the popu-

lation dense. One-fourth of the people are native Hawaiians; nearly one-half are either Chinese or Japanese. The number of Americans is increasing rapidly.

The islands are of volcanic origin. Their surface presents striking contrasts. In the same region are high volcanic mountains, and fertile valleys. The fact that less than 2 per cent of the land is cultivable suggests the ruggedness of the islands.

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FIG. 73. — IN THE HEART OF A BANANA PLANTATION, HAWAIIAN ISLANDS

Originally the mountains were forested. While extensive forests still remain, wasteful methods of lumbering have destroyed much valuable timber.

Though the Hawaiian Islands are in the same latitude as Mexico City, the climate is much more desirable. The modifying influence of the ocean is so pronounced that while the winter climate is never colder than 52° F., the summer climate is never hotter than 92° F.

The rainfall is abundant on the windward or northeast slopes of the mountains. The leeward slopes, however, are so arid that irrigation is often necessary.

Raw sugar constitutes the chief article for export. The cane is grown in the valleys and on the windward slopes of the mountains. The sugar plantations are very large and are owned by large companies. On the leeward slopes of the mountains are large coffee plantations.

The position of these islands, at the *crossroads* of trade on the Pacific, renders them very valuable as coaling stations. The completion of the Panama Canal has very materially increased their commercial importance.

PORTO RICO

Porto Rico is the smallest island of the Greater Antilles group, West Indies. It is about one hundred miles long, and is a third larger than Delaware.

With the exception of a low east-west range of mountains through the center of the island, the surface is well suited to agriculture. Unlike our other possessions, Porto Rico is very densely populated, — about ten times as densely as the United States.

The people do not live in cities, but are scattered on small farms over the entire island. Though the methods of agriculture are primitive, the crops are good, due to an excellent climate and a high degree of soil fertility. The principal crops are sugar, coffee, and tobacco.

Since the United States took possession of Porto Rico, it has developed rapidly. Each year its foreign trade has increased. Along educational lines the advancement is most rapid. The interest that the United States has taken in Porto Rico is shown by the fact that it has paid the expenses of many hundred Porto Rican public school teachers to come to this country and study in the summer schools of our great universities. These teachers have been able to do much for their people by taking to them the American spirit and American ideals.

PROBLEM 1: Of What Importance is Alaska to the United States?

1. When did we come into the possession of Alaska? How?

2. Compare the area of Alaska with that of Texas; with the area of your own state.

3. Consult a map showing the distribution of gold and silver in the world. Name the precious metals found in Alaska. Consult the table in your textbook showing the world's output of gold. Write a sentence in which you give Alaska's rank in gold production.

4. Consult a good map of Alaska. Locate the Klondike region. It lies in what two countries? What city is situated in the center of the district?

5. Read the descriptive matter in your textbook. If possible read an article on the Klondike in an encyclopedia or geographical reader.

6. The method of mining in the Klondike is known as "placer mining." Has your textbook a picture showing the method? Describe it in class.

7. Alaska exports most of its gold to what country?

8. What does your textbook say about coal in Alaska? How can you account for the fact that this coal is not mined to any extent? Are these extensive fields of any importance to the United States? Why?

9. Re-read the material in your textbook regarding the forests in Alaska. Are they extensive? Where are they found? Is lumbering carried on? Explain. Of what importance to the United States is this timber reserve?

10. List the kinds of fishes caught in Alaska. Where is the center of salmon fishing? Where are the seals caught? How has the character of the shore line furthered the fishing industry?

11. Write a short paragraph giving several ways that Alaska is of importance to the United States.

EXERCISE 1: Agriculture in Alaska

1. Draw an outline map of Alaska. Trace the Yukon River. How many degrees north of your home state is the southern part of Alaska? How much of Alaska is in the North Frigid Zone? What, then, is the nature of the climate? Verify from your textbook.

2. Indicate by arrows the direction of the prevailing winds in Alaska. Show where conditions are favorable for abundant rainfall. Where would the rainfall be greatest? Where least? What does your textbook say about the rainfall of Alaska? How would the heavy rainfall of the coast district affect the temperature? Explain.

3. Consult a relief map of North America found in your textbook. Where are the mountains? The plateaus? The lowlands?

4. Name two kinds of soils found in Alaska. Why are the soils sometimes *sour?* How should sour soils be treated?

5. Re-read the descriptive matter in your textbook. List the agricultural products. What part of Alaska is best suited to agriculture? Show this area on your map.

6. Write a short paragraph giving two conditions that are favorable to agriculture and one that is not.

7. Review in class the description of Alaska as given on pages 181–182.

EXERCISE 2: Size and Position of the Philippine Islands

1. Find a map of the Philippine Islands in your textbook. Be able to spell and pronounce the names of the two large islands. About how many islands are there in all? How many that are fairly large? How does the area of the Philippines compare with that of your own state? Record.

2. What city in Mexico has the same latitude as the northern extent of these islands? What is the latitude? Compare the latitude of the Panama Canal Zone with that of the southern extent of the Philippines. What is the latitude of each? What is the length of the archipelago in degrees? In miles?

3. Through how many degrees of longitude would a boat pass in sailing from the Panama Canal to the Philippines? What would be the distance in miles?

4. How far are the Philippines from Japan? From China? From Australia?

EXERCISE 3: Agriculture in the Philippine Islands

1. How were the Philippine Islands formed? What kind of soil does lava make? What does your textbook say about the soil in these Islands? Where is it most fertile? Write a sentence in which you describe this soil.

2. Read carefully the descriptive matter in your textbook. What mention is made of mountains? Of fertile plains and river valleys? Why do you think the surface of the Philippines is well suited to agriculture? Explain.

3. Consult a rainfall map of the world, found in your textbook. Compare the rainfall of the Philippine Islands with that of the best-watered parts of the United States.

4. Re-read your textbook for statements regarding rainfall in the Philippines. During what season does most of the rain fall? Why then?

5. Tabulate the agricultural products of the Philippines as given in your textbook.

6. Write a short paragraph in which you give three reasons why the Philippine Islands are well suited to agriculture.

7. But one acre in thirty is cultivated. What does this suggest concerning the possibilities of the future?

HEMP GROWING

Hemp is a fiber similar to flax, but coarser and stronger. This fiber is produced by the hemp plant, which belongs to the nettle family; in fact, the common nettle was extensively used for its fiber in Europe

before the expansion of the cotton industry. The hemp plant varies in height greatly; sometimes it is only three feet tall, then again it attains the height of twenty feet. Its average height is about equal to that of corn. The stalks are one-half inch in diameter and hollow; the

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FIG. 74. — MAKING ROPE FROM FAMOUS NATIVE HEMP, MANILA, P. I.

fibers consist of the long cells of the inner bark, which, when cleaned, form tough strands that are nearly as long as the plant itself.

Not all hemp, however, is obtained from the hemp plant. We get *sisal* hemp from the long, fleshy, sword-shaped leaves of a plant not unlike the century plant. Each plant yields about fifteen leaves a year for a period of twenty-five years. It requires a dry, limestone soil,

and thrives in Mexico, Cuba, Hawaii, and on the naked coral reefs of Florida.

The fiber is whiter, cleaner, and lighter than ordinary hemp, and ranks in strength with the best Manila hemp; though, unlike the latter, it cannot withstand salt water, hence is not used for ship cordage. The United States is the largest consumer of sisal hemp. We use it most extensively in manufacturing twine for self-binding harvesters.

Our supply of Manila hemp is secured from the leaf sheaths, or apparent trunks, of several species of non-edible banana plants that grow in the Philippines, chiefly in the southern part of Luzón. Even here they are not grown extensively, but only on well-watered hillsides where the drainage is excellent and the soil volcanic. The Manila fiber is white, easily separated, and strong. It is used almost exclusively for ship cables and marine cordage for the reason that it does not rot readily when exposed to salt water, and does not stiffen or harden when wet. The finer inner fibers are woven into delicate fabrics. From the very finest, veils and crêpes are made. Manila hemp is the leading export of the Philippine Islands.

EXERCISE 4: Importance of Porto Rico to the United States

1. Sketch an outline map of Porto Rico. Using the scale, determine its length and width. What is its area? How does it compare in extent with Rhode Island? Locate its two important cities.

2. In what direction from the United States is Porto Rico? In what zone is it? How far is it from New Orleans?

3. Does your textbook mention forests in Porto Rico? Where are they? How extensive? Contrast the kinds of woods found in Porto Rico with those found in the United States.

4. What does your textbook say about the climate of Porto Rico? Is the rainfall sufficient for agriculture? What reference is made to the soil? Is it fertile or infertile? Make a list of the products as given in your textbook.

5. In 1906 Porto Rico's trade with the United States amounted to $23,000,000. What do you think Porto Rico shipped to this country? Verify from your textbook. Large sugar refineries are located at New York. Where do you infer a part of the sugar refined in New York comes from? Verify from your textbook.

6. What do we mean by an outlying coaling station? Why do you think Porto Rico is useful to the United States in this respect?

PROBLEM 2: Why are the Hawaiian Islands valuable to the United States?

I

1. Find the Hawaiian Islands on a good map. By use of the map scale, find their approximate distance from San Francisco. What is their longitude? Their latitude?

2. Read in your textbook to learn the origin of these islands. In one or two sentences summarize the account given in your textbook.

3. Locate the active volcano of these islands. Learn to spell and pronounce its name.

4. Re-read the material in your textbook to learn the character of the soils. Express in a sentence. How does the climate favor agriculture?

5. Enumerate the products of the islands. Write neatly.

6. Make a graph to compare the output of sugar with that of Louisiana.

II

7. Make a graph to compare the output of rice with that of Texas.

8. Locate the leading commercial city of Hawaii.

9. What possessions of the United States lie west of Hawaii? Why do these possessions give Hawaii added importance to the United States?

10. How will the opening of the Panama Canal affect the traffic of Hawaii? Write an explanation.

EXERCISE 5: The Panama Canal Zone

1. On a good map in your textbook find the city of Panama. On what ocean is it located? In what bay?

2. In a similar manner locate the city of Colon. In what direction is Colon from Panama?

3. By the use of the scale determine the distance between these two cities. A strip of land ten miles wide and extending from one city to the other is known as the Panama Canal Zone.

4. Why do you think we purchased this land? Of what importance is it to the United States?

5. Make a neat sketch of the Zone, indicating the terminal cities.

EXERCISE 6: The Panama Canal

1. With the aid of a map of the world, indicate the route a ship would take from San Francisco to New York before the Panama Canal was built.

2. Trace the route the ship would take if it passed through the Canal. About how many miles would be saved by the latter route? About how many days, if the boat went fifteen miles an hour?

3. Recalling the great markets of the United States, how would Ecuador be affected by the Canal? How would Venezuela be affected?

4. As the use of the Canal increases, how may the traffic of the railroads that cross the continent be affected?

5. From any sources that are available learn the following facts about the canal —

(*a*) Its width.
(*b*) Its depth.
(*c*) Its length.
(*d*) Its cost.

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INDEX

Air, capacity of, for moisture, 162.
Alabama, soil belts of, 33.
Alaska, 181–182; agriculture in, 186; importance of, to the United States, 185.
Alleghany Plateau, 50–52; extent of, 54; soil and industries of, 61.
American possessions, 181–191.
Appalachian Mountains, 48, 49.
Appalachian Region, 48–66.
Apple industry, 72, 110.
Atlantic City Sheet, exercise on, 25–27.
Atlantic Coastal Plains, 17–30; industries of, 24, 28, 29; inland cities of, 19, 20.

Bad Lands, 112.
Basin Region, 152–157.
Beef cattle, 126.
Beet sugar industry, 133–134.
Birmingham, conditions favoring, 46.
Black Hills, 112.
Boothbay Sheet, exercise on, 8.
Boston, conditions favoring development of, 15.

California, products of, 164.
Canal, The Erie, 59, 60.
Cascade Mountains, 154, 158, 159.
Chesapeake Bay, oyster industry in, 27–28.
Chicago, importance of, 102.
Coal, 56, 58; distribution of, 58.
Coal industry, 54, 57.
Colorado, map study of, 131–132.
Colorado Plateaus, character of, 143–144; extent and origin of, 144; population of, 148; surface and soils of, 145, 146.
Colorado River, 146.
Columbia Plateau, general character of, 135–137.
Columbia River, fisheries of, 170.
Connecticut River, 2.
Corn, production of, 96–98; uses of, 98–100.
Corn Belt, 100.
Cotton, areas producing in United States, 37; production of, 34–36.
Cyclones, causes of, 114–115; effect of, on rainfall, 117–118.
Cyclonic storms, study of, 115.

Dairy industry, 73–74; in New York, 59; in Wisconsin, 74–75.
Denver, 132.
Detroit, 86.
Donaldsonville Sheet, exercises on, 32.
Dry farming, 137–140.
Duluth, 86.

Fish, in Columbia River, 170; off the Grand Banks of Newfoundland, 10; off the New England coast, 10.

Florida, fruit-growing industry in, 25; industries of, 44, 45.
Fruit industry, in California, 167, 169; in Florida, 44, 45; in Michigan, 71, 72; in New York, 64.

Glacial Scratched Rock, 2.
Glacial Soils of Prairie Plains, 94.
Glaciated surface, study of, 70–71.
Glaciation, in New England, 3; in North America, 92.
Grand Rapids, why furniture center, 77.
Great Basin, 152–157; cities of, 156, 157; extent of, 154; natural resources of, 155–156; rainfall of, 154–155; soil resources of, 155.
Great Lakes, 69–70.
Great Plains, general character of, 111, 112.
Great Valley of Appalachians, 53.
Gulf Coastal Plains, general character of, 31–32.

Hawaii, 183, 184.
Hawaiian Islands, why valuable to United States, 190.
Hemp industry, 187–189.

Iron and steel industry, 78–84.
Iron manufacture in Lake Erie cities, 86.
Iron ore, distribution of, 84; kinds of, 78; methods of mining, 83.
Irrigation, in United States, 148–150.

Kaibab Sheet, exercise on, 148.
Kansas City, 103, 126.
Kentucky, Blue Grass Region of, 52; tobacco culture in, 62.

Lake Plain cities, 70.
Land, average value of, 104; percentage cultivated to total area, 174–175.
Lava flows in Washington, 135–136.
Lead and zinc, mining of, 108–110; in Joplin district, 107; in Wisconsin district, 109.
Lemons, growing of, 167.
Louisiana, sugar production of, 41.
Lumber, output of leading states, 165.

Map Interpretation, Washington and Oregon, 140.
Maps, United States Geological Survey, 10.
Meat packing, 121.
Merrimac River, 8; falls of, 6.
Mesaba Range, 79–80.
Michigan, copper mining in, 84–85; fruit industry of, 71–72.
Minneapolis, conditions contributing to growth of, 75–76.
Mississippi River, lower, 33; upper, 93–94.
Mountains, old and young, 2.
Mt. Hood, 180.
Mt. McKinley, 181.
Mt. Shasta Sheet, exercises on, 178–180.

Navigable waters in United States, 105.
New England, agriculture in, 11, 12; coast fishing industry of, 10; coast

line of, 3, 4; forests and lumbering in, 11; influence of coast line on industries of, 14; influence of rivers, 7; manufacturing in, 13; position and area of, 4; product map of, 16; rocks of commercial importance, 12; soils of, 4; surface of, 1, 5.
New England Plateaus, 1–16.
Newfoundland, fishing grounds of, 10.
New Orleans, commercial importance of, 45, 46.
New York City, influences favoring growth of, 21.
New York, Pennsylvania, and New Jersey, production map of, 30.

Ocean currents, 163–164.
Ohio River Floods, 65–66.
Oil and gas deposits, 173–174; in Indiana and Illinois, 91.
Omaha, 103.
Oranges, growth of, 167.
Ozark Region, 107–110.
Ozark uplift, surface, soil, and industries of, 107–108.

Pacific Slope, cities of, 177; climate of, 161; drainage of, 160; forests of, 165; general character of, 158–162.
Panama Canal, 190–191.
Peoria, 99.
Petroleum industry, 171–173, 174.
Philadelphia, 19.
Philippine Islands, 182–183; agriculture in, 187.
Phœnix, 146.
Piedmont Belt, 48–49, 53.
Pineapple industry, 44–45.
Pittsburg, 60.
Platte River, 118–119.
Population, density of, in United States, 156–157.
Porto Rico, 185.
Potato industry, 63–64.
Prairie Plains, agriculture in, 95; commercial and industrial centers of, 102; extent of, 92, 93; general character of, 88–91; rainfall of, 95, 96; soils of, 94, 95.
Production Map, 30.

Rainfall and progress in Dakotas, 118.
Rice, cultivation of, in South Carolina, 43; introduction of, in United States, 41, 42; production of, in Arkansas and Texas, 42.
Rivers, influence of, in New England, 7.
Rochester, nurseries of, 64.
Rocky Mountains, general character of, 129–130; extent of, 130.
Rocky Mountain States, population of, 132; products of, 132.
Roosevelt Dam, 150.
Round-up on Great Plains, 119–121.

St. Louis, reasons for importance, 103.
St. Paul Sheet, 70, 71.
Salt industry in Kansas, 113.
Salt Lake City, 154.
San Francisco, 177.
Seattle, 177.
Sheep raising, 124.
Sierra Nevada Mountains, 158.
Soil, productive capacity of, 101.
Sugar cane, 38; loading of, at New Orleans, 38; manufacture of, 39, 41.

Tennessee, 61.
Texas, leading products of, 37.
Tobacco culture in Kentucky, 62.
Truck farming in New York, 64.
Turpentine industry, 29.

Valley, Connecticut River, 2.

Washington, D.C., 19.
Washington, winter temperature of, 163.
Washington and Oregon, production map of, 166.
Wheat industry, 124–126; in Washington, 141.
Willamette Valley, hop industry in, 169.
Wisconsin, leading dairy state, 74–75.
Wool industry, 120–124; kinds of, 122; manufacture of, 122–124.

Zinc, in Joplin district, 107; in Wisconsin district, 109.

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